Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

MARCH ★ 1951

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 107—Journal Section of the American Society of Heating and Ventilating Engineers

Furnace suppression meter aids safety in Toledo extraction process . . . page 99

Piping Maintenance at Big Plant 73

Continuous Baseboard Heating 88

Air Conditioning an Added Hoer . . 102

Protective Shelters in Modern War . 77

Complete contents, page 5 . . . Sam Lewis, page 105 . . . Question of the Month, page 104 . . . "Open for Discussion," page 40

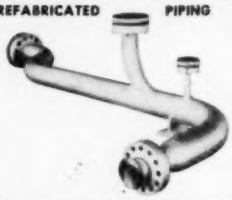
EVERYTHING FOR PIPING

PIPE HANGERS and SUPPORTS

CAST IRON FITTINGS

WELDING FITTINGS

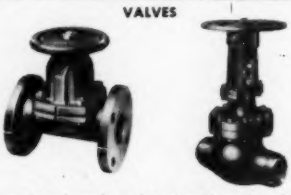
PREFABRICATED PIPING



MALLEABLE IRON FITTINGS

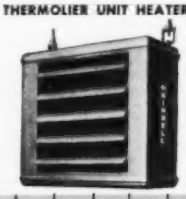
FORGED STEEL FLANGES

VALVES

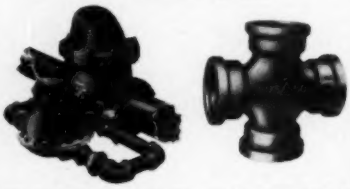


STEEL NIPPLES

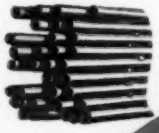
THERMOLIER UNIT HEATERS



WATER WORKS SPECIALTIES



PIPE



PLUMBING and HEATING SUPPLIES

at your nearby GRINNELL Warehouse or Jobber

Whatever your requirements for pipe, fittings, valves and other standard piping materials, you can get prompt delivery from a Grinnell warehouse or jobber. When the job calls for specialized piping products or installations, Grinnell has the manufacturing facilities, products, experience and engineering knowledge to "deliver the goods".

GRINNELL

WHENEVER PIPING IS INVOLVED

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago Cleveland • Cranston • Fresno • Kansas City • Houston • Long Beach • Los Angeles • Milwaukee • Minneapolis • New York Oakland • Philadelphia • Pocatello • Sacramento • St. Louis • St. Paul • San Francisco • Seattle • Spokane

Tools of Air Conditioning

JOB IDEAS BY **usAIRco**

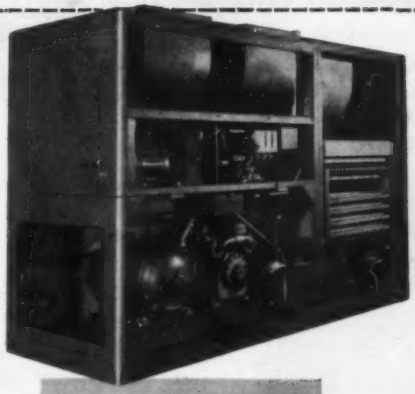
BLOWERS

for Industrial and Commercial Use

TYPE FC. For ventilating or exhaust duty. Forward curved blade type built in single and double inlet models with standard discharge arrangements . . . Bulletin No. 440

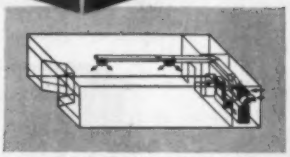
TYPE A. Backward inclined blade blowers. Generally specified for higher pressures and non-overloading characteristics. Suitable for direct motor connection . . . Bulletin No. 440

TYPE CH. Single inlet, single width forward curved blade blower. Assembled as completely weather-proofed housed ventilating set. Use indoors or outdoors . . . Bulletin No. 52

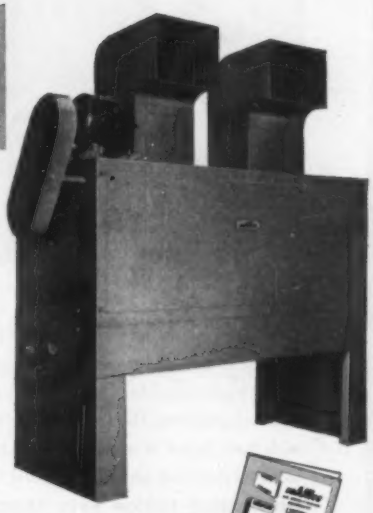


REFRIGERATED KOOLER-AIRE
Complete Air Conditioning
. . . Easy to Install

For that store, office or theater installation, here is a complete, pre-engineered, integrated central system in one compact unit. No complicated plumbing layouts, roof tower, or building alterations needed. Simply install usAIRco's R-K and your conditioning job's done. Just 3 simple connections. Every tube, condenser, pipe, blower, motor, coil and wire is connected, charged, tested, balanced, ready to run. Sizes from 3 to 40 tons.



TYPICAL STORE INSTALLATION OF R-K



For heating large volumes of air: Blower-type unit heaters

Designed for wide application in factories, warehouses, garages. Can be used in any one of four positions: for floor, ceiling, inverted or wall mounting. Units built in sections for easy handling, installation, maintenance. Available with standard steam or steam distributing tube coils in any one of five capacity sizes. Standard unit consists of blower section, coil section and accessories as required including filters, mixing chambers and face and by-pass dampers. Built in eight sizes from 37,500 Btu to 1,995,000 Btu per hour.

usAIRco
Everything In Air Conditioning

UNITED STATES AIR CONDITIONING CORPORATION
3300 Como Avenue S.E. Minneapolis 14, Minnesota

● Please send your descriptive bulletin on the "Tools of Air Conditioning."

NAME_____

ADDRESS_____

FIRM_____

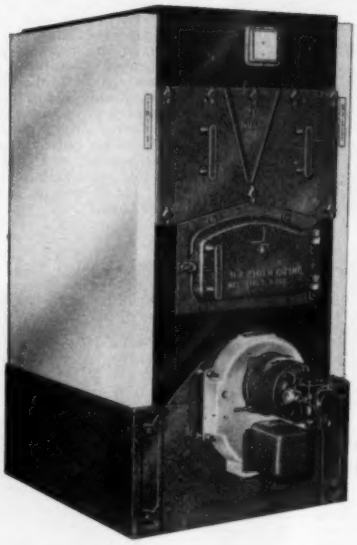
CITY_____ ZONE____ STATE_____

for larger homes

or

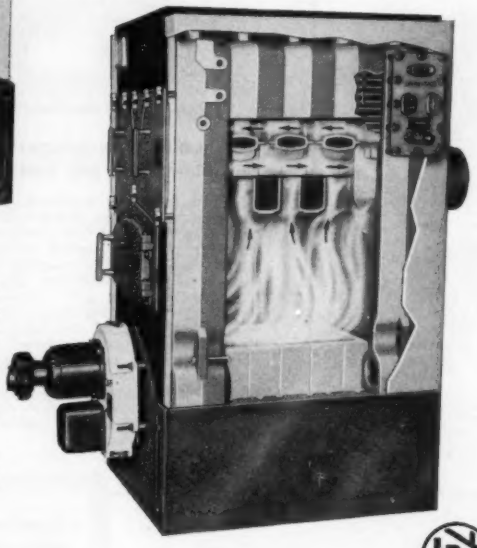
small business establishments

H. B. SMITH "2,000" BOILER BURNER UNIT

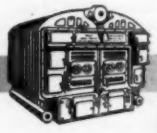


Engineered for high efficiency

Here's an integral boiler burner unit of high efficiency. Based on the famous Mills "20" boiler, it includes an improved oil burner engineered for this specific purpose. Recommend the "2000" for applications requiring net I=B=R steam ratings of 675 to 1275 sq. ft. or equivalent hot water ratings.



Cut-away view shows the sturdy cast iron construction and engineered Mills flue travel which provides fast heat and economical operation. The "2000" is available with flush jacket or with jacket extended to conceal the oil burner. Supplied with large-capacity tankless water heater or built-in storage tank heater. Black and cream enamel finish.



H. B. Smith CAST IRON BOILERS

Reg. U. S. Pat. Off.

The H. B. SMITH CO., INC. • WESTFIELD, MASS.

OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES

Heating Piping & Air Conditioning

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

BOARD OF CONSULTING AND CONTRIBUTING EDITORS . . . .

N. R. Bernz, Leo F. Collins, Sabin Crocker, R. C. Doremus, Philip Drinker, M. K. Fahnestock, Walter L. Fleisher, F. E. Giesecke, William Goodman, William A. Hanley, J. J. Harman, R. S. Hawley, E. P. Heckel, R. E. Hieronymus, J. C. Hornung, Lee P. Hynes, C. W. Kimball, Dwight D. Kimball, A. C. Kirkwood, Charles S. Leopold, Samuel R. Lewis, H. C. Murphy, Alfred J. Offner, F. B. Rowley, Robert P. Schoenijahn, Kalman Steiner, T. S. Tenney, Rush D. Touton, Eph. A. Tyler, W. H. Wilson

EDITOR . . . . C. M. BURNAM, JR.

ASSOCIATE EDITOR . . . . THOMAS V. JOHNSON

ADVERTISING STAFF . . . .

Wallace J. Osborn, New York—Murray Hill 9-8293 . . . . Robert A. Jack, Cleveland—Yellowstone 2-1540 . . . . James D. Thomas and George C. Cutler, Chicago—State 2-6916 . . . . R. P. Wettstein, Los Angeles—Dunkirk 8-2286, Portland—Atwater 4107, San Francisco—Yukon 6-2522

PUBLISHER . . . . FRANK P. KEENEY

MANAGER . . . . CHARLES E. PRICE

CIRCULATION DIRECTOR . . . . FRANK S. EASTER

PRODUCTION MANAGER . . LAWRENCE A. DOYLE

Published monthly by the Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill. Telephone: STate 2-6916. Subscriptions: U.S. and possessions, $3.00 per year; Canada, Cuba, Mexico, Central America, South America, $4.00 per year; other, $6.00. Current copies, U.S. and possessions, 35c each; back copies, 40c each. January 1951 issue, $1.50 per copy. For change of address, notify publisher and your local postoffice of both old and new addresses by the 15th of the preceding month. Member Audit Bureau of Circulations and Associated Business Publications, Inc. Heating, Piping & Air Conditioning is indexed regularly by Engineering Index, Inc. Copyright 1951 by the Keeney Publishing Co. Entered as Second Class Matter May 18, 1929, at the Post Office at Chicago, Ill., U.S.A., under the Act of March 3, 1879. Additional entry at Mendota, Ill.

MARCH 1951 . . . Vol. 23, No. 3

The Editor's Pages (news, notes and comment) 65

"Open for Discussion" (a regular feature) 69

Piping System Maintenance at Western Electric Plant, by A. H. Gipson and D. C. Gerloff 73

Protective Shelters in Modern Warfare, by Warren Viessman 77

Practical Pointers on Air Conditioning Operation, by John D. Constance 82

Use of Welding to Facilitate Piping Suspension and Support, by George W. Hauck 83

How to Use Continuous Circuit Baseboard Heating System, by Roger A. Parsons 88

Helpful Hints on Plant Maintenance Work 90

Oxygen Piping Systems an Important Hospital Service 94

Limit Use of Water for Air Conditioning? 97

Combustible Gas Alarm Aids Safety in Solvent Extraction 99

Adding Floor Presents Air Conditioning Problem, by Willard B. Buck .. 102

Question of the Month—Improving Hospital Heating 104

Sam Lewis' Page—Correcting Faulty Jobs 105

Equipment Developments 213

Who's What 236

New Books and Reports 246

Meetings and Conventions 252

Recent Trade Literature 258

Index to Advertisers 272

Journal Section of the American Society of Heating and Ventilating Engineers . . .

A Survey of Electrostatic Precipitation, by Eric A. Walker and John E. Coolidge 107

57th Annual Meeting—Proceedings 112

1950 Annual Report of the Committee on Research 132

Westward Ho!—Semi-Annual Meeting 1951 139

Summary of Chapter Meetings 140

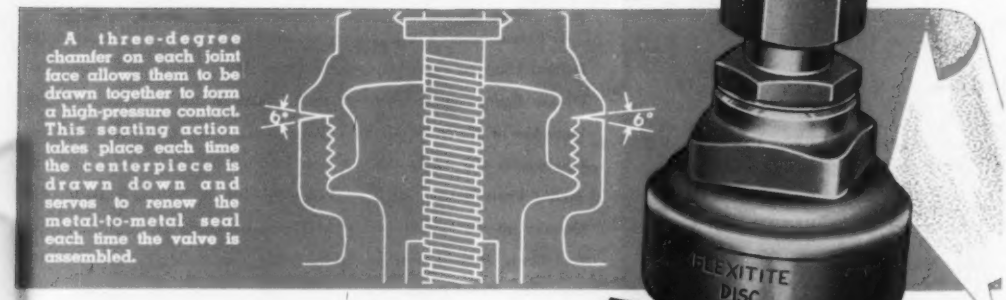
Candidates for Membership 148

Officers, Council and Committees 151

Six Degree Clearance

MAKES O-B CENTERPIECE JOINTS

SELF-SEALING NON-LEAKING



A three-degree chamfer on each joint face allows them to be drawn together to form a high-pressure contact. This seating action takes place each time the centerpiece is drawn down and serves to renew the metal-to-metal seal each time the valve is assembled.

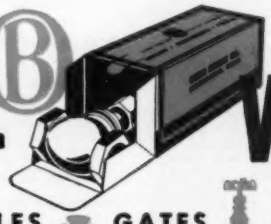
O-B No. 28 Line Gate
100 pounds W. S. P.
150 pounds W. O. G.
Also available with solder-type pipe ends

No messy joint compound--no gaskets to fuss with. Simply turn the centerpiece snug against the valve body, and the joint is sealed tight. The chamfered faces result in a six-degree clearance at the joint (see diagram) which permits the centerpiece to be drawn down to form a high-pressure line contact. This metal-to-metal contact more effectively seals the joint against leaks than the old-fashioned method of using gaskets or joint-sealing compounds.

Designed by men who have an intimate knowledge of the plumbing and heating business, and made by a company with more than sixty years of valve manufacturing know-how, you can feel confident when you install O-B valves.

You will find a full line of low and standard pressure valves at your local Ohio Brass distributor. Call him for any of your valve needs.

OHIO BRASS CO. MANSFIELD, OHIO



Ohio Brass VALVES

BRONZE GLOBES ANGLES GATES AND CHECKS

Pritchard's NEW, Better-Than-Ever Packaged COOLING TOWERS

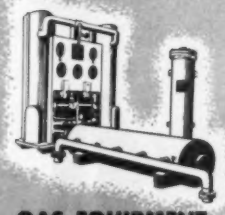
Help You Save Water

You can now put water conservation to work efficiently and economically on air conditioning and refrigeration installations with Pritchard's new Series "P" Packaged Cooling Towers. This *low cost* Induced Draft Tower is built to give up to 20 tons capacity.

Manufactured of highest quality materials, the Series "P" tower is shipped either "knocked down" or shop assembled, and is available in painted steel, stainless steel or aluminum. Easily installed.

Protect our natural resources. Prevent water wastage!

Wherever you see a Pritchard Cooling Tower, you see water conservation at work!



Write for
FREE BULLETIN
No. 5.6.082.

Producers of QUALITY Specialized Process EQUIPMENT

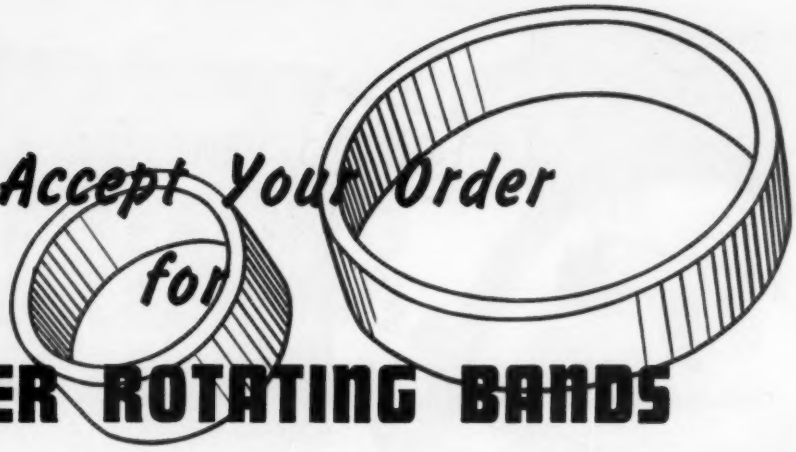
J.F. Pritchard & Co.

DESIGN • ENGINEERING • CONSTRUCTION

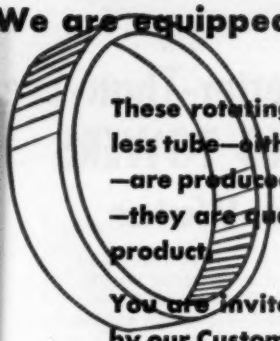
Dept. No. 15 908 Grand Ave., Kansas City 6, Mo.

District Offices
CHICAGO • HOUSTOH • NEW YORK • PITTSBURGH • TULSA • ST. LOUIS
Representatives in Principal Cities from Coast to Coast

We'll Accept Your Order for COPPER ROTATING BANDS



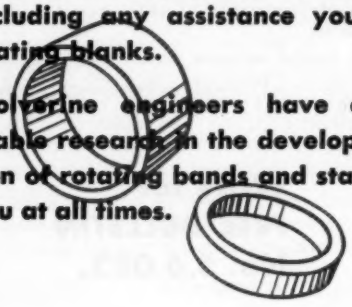
We are equipped to make sizes up thru 155 MM



These rotating bands—made of Wolverine seamless tube—either all copper or 90-10 gilding metal —are produced under most exacting specifications —they are quality-controlled from ore to finished product.

You are invited to draw on the facilities offered by our Customer Engineering Service for any help you need regarding this type of material—including any assistance you may require in seating blanks.

Wolverine engineers have conducted considerable research in the development and production of rotating bands and stand ready to assist you at all times.



WOLVERINE TUBE DIVISION

Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, non-ferrous tubing
1419 CENTRAL AVENUE • DETROIT 9, MICHIGAN
Plants in Detroit, Mich. and Decatur, Ala.

Sales Offices in Principal Cities

Wolverine Mill Depots:
DETROIT, MICH. • DECATUR, ALA. • HOUSTON, TEXAS • LOS ANGELES, CALIF.
LONG ISLAND CITY, N. Y. • PHILADELPHIA, PA. • PROVIDENCE, R. I. • ST. LOUIS, MO.

Export Department, 13 E. 40th St., New York 16, N. Y.

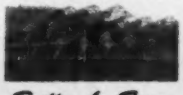
FAR-AIR® offers you...

Completely Automatic air filtration!

FAR-AIR Self-Washing Filters are a sound and profitable investment. The many *plus* features engineered into each unit assure outstanding performance. For instance, cleaning and re-oiling at the proper time for peak efficiency is controlled automatically, which virtually eliminates all maintenance except for periodic inspections. Other features include the prevention of oil entrainment, elimination of messy oil sumps (water and dirt are quickly flushed away), automatic fire control and ease of installation.

FAR-AIR Self-Washing Filters are adaptable to most air cleaning uses because they will handle any CFM requirement. The Farr Company engineer near you will be glad to suggest an installation to meet your specific problem. Complete literature is available upon request. Write Farr Company, 2615 Southwest Drive, Los Angeles 43, California.

FAR-AIR FILTERS



Better by Farr

*Trade Mark Reg.

FARR COMPANY *Manufacturing Engineers*

Los Angeles · Chicago · New York

M'f'd under license by Control Equipment Co., Ltd., Montreal, Canada

Some of the Many Installations of

POWERS

Pneumatic Temperature Control

In Contemporary Secondary Schools

Assures Utmost Comfort and Efficiency of Teachers and Pupils

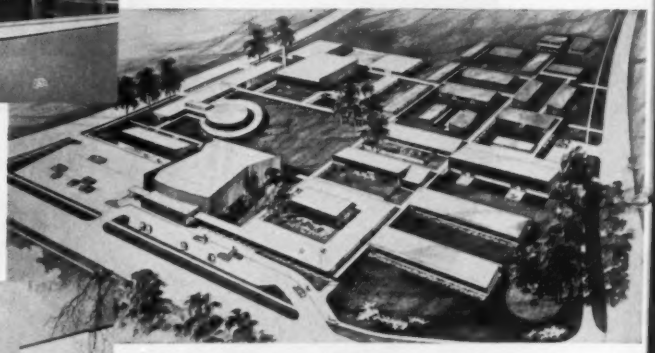
Lower Maintenance—Bigger Fuel Savings

Many 25 to 40 year old installations still giving dependable regulation

. . . . . these and many other plus values in POWERS systems of temperature control give users more for their money

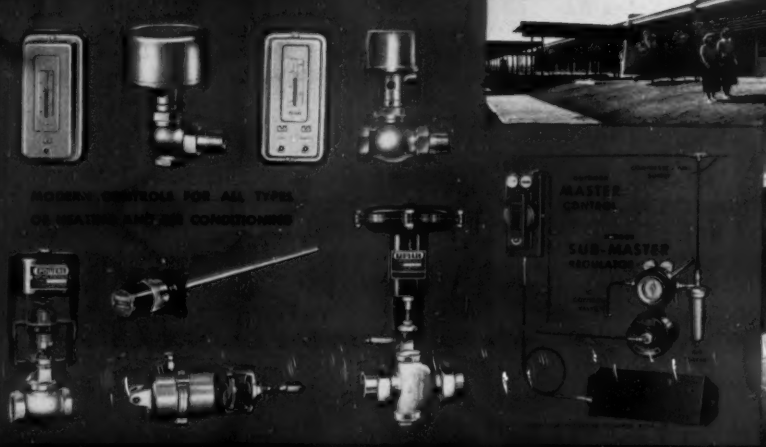
Above: Junior High School 54, Manhattan, New York City.
Architect: Eric Kebbon. Engineer: T. F. Dwyer, Board of Education, City of New York.
Heating Contractor: Daniel J. Rice, Inc., Long Island City, N. Y.

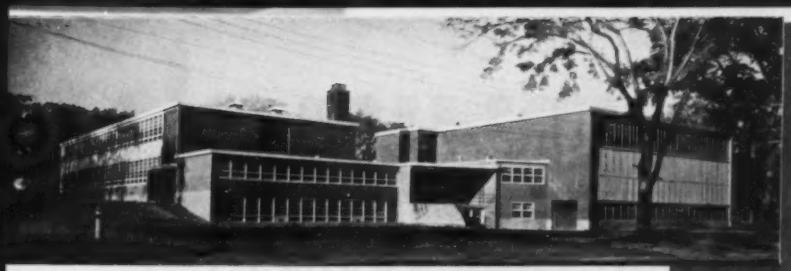
Below: Archbishop Williams High School, Braintree, Mass.
Architects: Maginnis and Walsh, Boston, Mass.
Engineer: A. Ehrenzeller, Boston, Mass.
Heating Contractor: Fred. Williams, Inc., Boston, Mass.



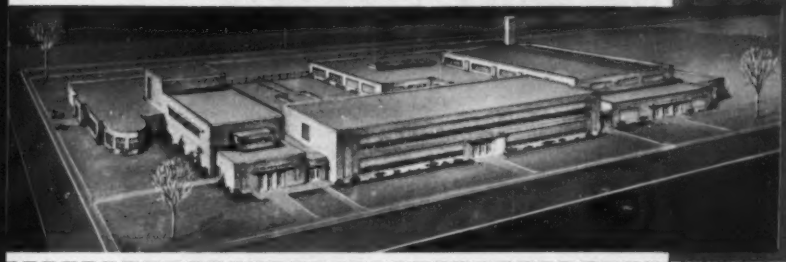
Above: Westchester Junior High School, Los Angeles, Cal.
Architects: Sumner Spaulding and John Rex.
Mechanical Engineers: Bartlett & Berky.
Heating Contractor: West Coast Plumbing & Heating Co.

Below: Farragut Intermediate School, Culver City, Cal.
Architects: Daniel, Mann and Johnson, Los Angeles, Cal.
Consulting Engineer: Kistner, Curtis and Wright.
Heating Contractor: S. Glen Hickman Co.





POWERS



POWERS

POWERS

POWERS

Below: Junior-Senior High School, Carthage, Texas

Architect & Engineer: Preston M. Geren, Fort Worth, Texas.
Heating Contractor: Spencer Plumbing & Heating Co., Dallas, Texas.

POWERS

THE POWERS REGULATOR CO.

Established 1891 • OFFICES IN OVER 50 CITIES • See Your Phone Book

CHICAGO 14, ILL., 2720 Greenview Avenue • **NEW YORK 17, N. Y.,** 231 E. 46th Street
LOS ANGELES 5, CAL., 1808 West 8th Street • **TORONTO, ONT.,** 195 Spadina Avenue
MEXICO, D. F., Edificio "La Nacional" 601

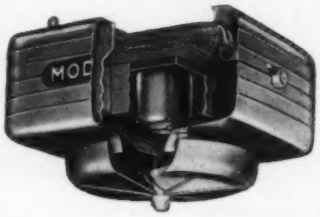
(RCH5)

For Greatest Comfort and Lowest Cost Maintenance Specify POWERS Control

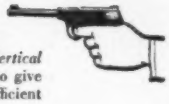
It pays to sight carefully when selecting Unit Heaters

SHOOT FOR CONSTRUCTION

There's *no guesswork* when you select Modines! Their record of satisfactory service backs up every claim made for them. Corrosion-resistant materials are used in all steam- and water-carrying passages. Maximum pressure resistance is assured by cylindrical tubes and headers, brazed at the joints. Parker-Bonderizing protects casings from rust.



SHOOT FOR PERFORMANCE



Modine Unit Heaters are champs in performance. *Horizontal, Vertical* or *Power Throw* — you may depend on the model you select to give you the right combination of correct outlet temperatures and sufficient air velocity for uniform comfort . . . at an *attractive* cost.

SHOOT FOR ECONOMY

Initial cost of Modine Unit Heaters is surprisingly low — upkeep is negligible. Impartial university tests — as well as many installation histories — prove that Modine Unit Heating saves up to 25% in fuel costs over direct radiation under identical operating conditions.

You're a winner everytime when you select Modine

Yes, sight carefully when selecting unit heaters! You'll find it pays off to select Modine. Wherever they're installed — in factories, stores, hundreds of other locations — Modine Unit Heaters stand out in service. Get all the facts from your nearest Modine representative. Or write direct. Modine Mfg. Co., 1509 Dekoven Ave., Racine, Wisconsin.

Ask for Modine Unit Heater Bulletin 149A. Also available — bulletins covering special applications in commercial brooder houses, greenhouses and milk houses.

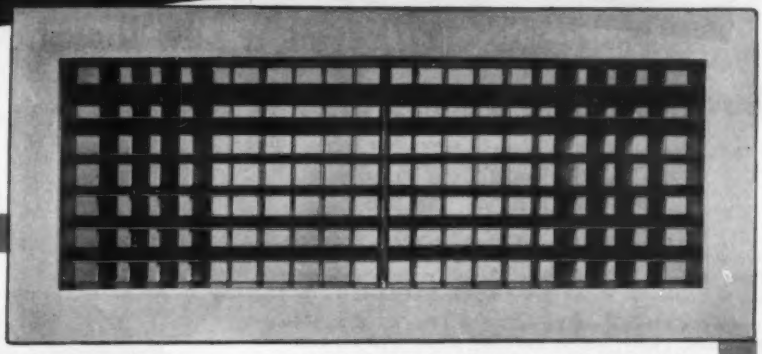
U-1096

Modine UNIT HEATERS

FOR FACTORIES • GREENHOUSES • STORES • COMMERCIAL BROODER HOUSES • MANY OTHER APPLICATIONS

A LOT MORE PERFORMANCE FOR A LOT LESS MONEY

Compare these unbeatable low cost
LIST PRICES
12 x 6 - - $3.40
14 x 6 - - $3.75
24 x 6 - - $5.35



THE ABSOLUTE ULTIMATE IN SUPER EFFICIENT AIR DIFFUSION

A NEW, LOW-COST AIR CONDITIONING GRILLE. You've wanted it — now you've got it. The Titus Airfoil No. 270 combines all the exclusive superior features of the famous Titus Airfoil Grilles and gives them to you in this great new grille AT A NEW LOW PRICE.

The new Titus Airfoil No. 270 has been time tested and proven after years of research. It also features the Airfoil louvre with streamlined, smooth-as-glass, surface, which knifes the air and gives more control than heretofore thought possible.

This amazing new Titus Airfoil No. 270 grille does everything the more expensive grilles do *and Does Them Better!*

BEFORE YOU BID YOUR NEXT JOB, SEND FOR COMPLETE INFORMATION ON THE TITUS AIRFOIL No. 270. You'll be amazed at all the performance features which are incorporated in this grille. They mean so much — YET COST SO LITTLE.

NOTE THESE SPECIAL FEATURES

which give the Titus Airfoil No. 270 unapproachable air diffusion performance

- **Airfoil louvre — designed after the Airfoil section of an airplane.**
- **Solid section louvre construction for noise-free performance.**
- **Streamlined louvre with no sharp corners, no holes, no crevices.**
- **One-piece, extra-heavy frame.**
- **Air-tight rubber gasket to prevent all air leakage.**
- **Two banks of louvres.**
- **Individual blade adjustment.**

Mail This Great Money-Saving Coupon Today!

TITUS MANUFACTURING CORPORATION
WATERLOO, IOWA

Gentlemen: Please rush me complete information including Prices, Discounts and Delivery on the new Airfoil No. 270.

*Name*_____

*Address*_____

*City*_____ *State*_____

There's a new look in b dings...

but the name on the pipe is the same...

SPANG CW

Radiant heating is the new look in heating for today's modern office, factory buildings and homes . . . and Spang CW Steel Pipe is your best buy for trouble-free radiant heating in all kinds of structures.

Your men will like the way Spang CW Steel Pipe fits up. It's uniformly top-quality, it bends smoothly and easily, is easy to cut and weld.

Spang CW Steel Pipe gives years of trouble-free service in modern closed-circuit heating systems. It's been a standard piping material ever since closed wet heating was developed, and it is used throughout industry for all kinds of services.

Spang CW Steel Pipe is distributed by leading supply houses everywhere. They handle the things you'll need to go with Spang CW Steel Pipe for radiant heating, snow-melting, and any other wet-type heating system. Tell them what you need . . . in spite of today's great demand for Spang CW Steel Pipe, they'll do everything possible to make deliveries quickly, fairly.

SPANG-CHALFANT

Division of The National Supply Company

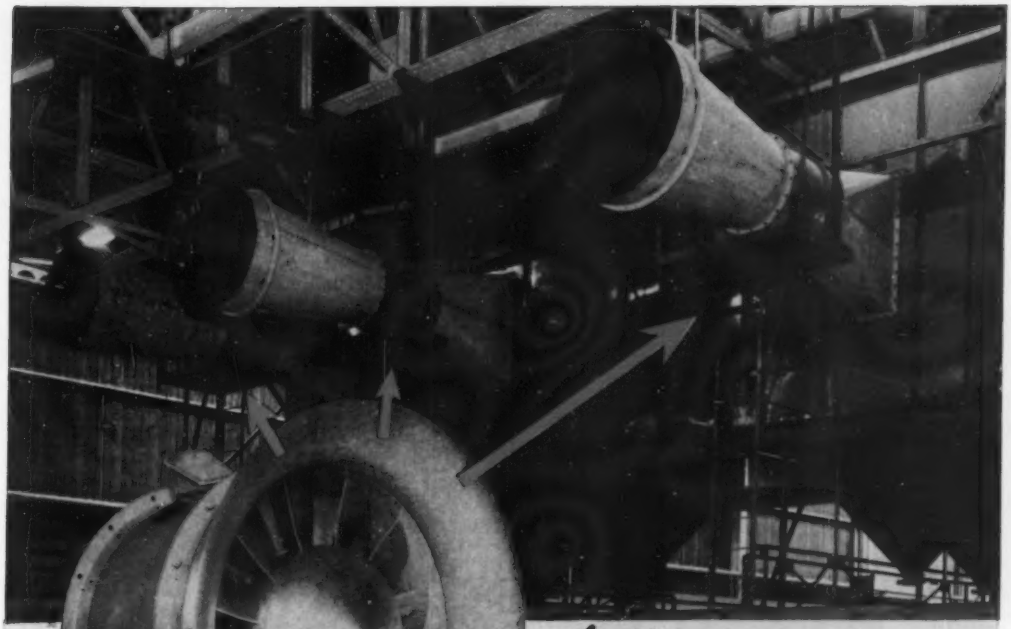
GENERAL SALES OFFICE: Grant Bldg., Pittsburgh, Pa.

District Sales Offices: Atlanta; Boston; Detroit; Houston; Los Angeles; New York; Philadelphia; Pittsburgh; St. Louis

SPANG

STEEL PIPE

QUALITY *that is recognized wherever pipe is used*



What's your ventilation job?

JOY AXIVANE* FANS

WILL DO IT MORE EFFICIENTLY AND MORE ECONOMICALLY!

Write for Bulletin, or *Consult a Joy Engineer*

From every possible angle, JOY Series 1000 AXIVANE Fans will give you a better, lower-cost job. Their inline, vane-axial design is lighter and more compact; and they operate more quietly, require less power and space, and save greatly on installation time and costs. What's more, you get the extra flexibility of adjustable blades—a standard JOY feature—permitting easy and quick on-the-job regulation of pressure or volume over a wide operating range, with positive protection against motor over-load.

Whatever your job is, JOY AXIVANE Fans can show you advantages—let us work with you.

*Reg. U.S. Pat. Off.

WAD 1 2356

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

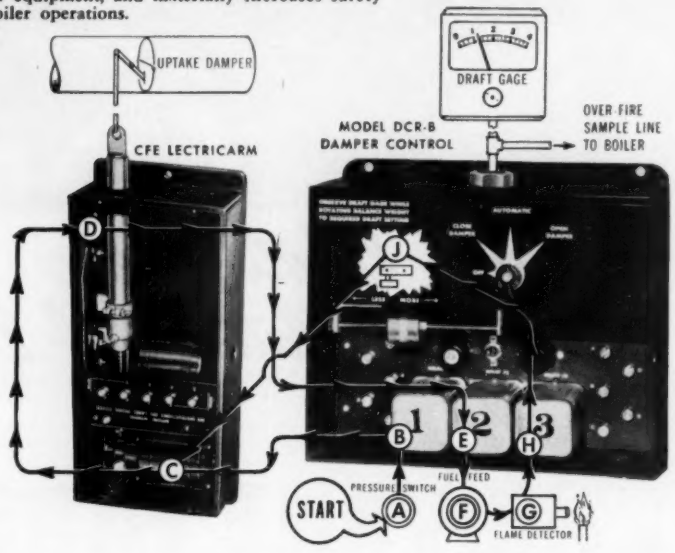
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

YOU CAN GET

Automatic Sequence Control at Low Cost with

CLEVELAND DAMPER CONTROL

The initial cost of this equipment is so low that most installations pay for themselves, in fuel savings alone, in less than a year. One compact unit contains all the elements for safe, automatic electrical control from over-fire draft, providing proper draft and proper timing to assure perfect combustion at all times. Applicable to oil, gas or stoker-fired boilers. Designed for use with C.F.E. indicating gages (draft, air pressure and flue temperature) and "Lectricarm" drive unit. In addition to fuel savings, CLEVELAND DAMPER CONTROL reduces smoke, soot and fly ash, prolongs life of boiler equipment, and materially increases safety of boiler operations.



HERE'S HOW IT WORKS: Steam pressure calls for heat, closing pressure switch (A). Signal goes to No. 1 relay (B), which energizes "Lectricarm" (drive unit) motor (C) to open uptake damper. When damper is open, with full draft established, drawbar actuates limit switch (D), signaling No. 2 relay (E), which then energizes fuel feed mechanism (F) to start firing. On oil or gas burners, a flame detector (G) signals No. 3 relay (H) when safe flame is established. No. 3 relay (H) transfers draft control to diaphragm operated switches (J), to establish automatic draft modulation by controlling reversible "Lectricarm" motor (C) linked to uptake damper, maintaining the predetermined most efficient setting. When pressure switch (A) is satisfied on oil or gas-fired boilers, No. 3 relay signals "Lectricarm" motor (C) to close damper until more heat is required. On stoker installations modulated draft continues until heat is again called for.

For further information, request Bulletin DCR-B or write for name of nearest agent

TYPICAL INSTALLATIONS

INDUSTRIAL PLANTS
Addressograph-Multigraph
Amer. Vitrified Prds. Co.
Armour & Co.
Baker-Raulang Co.
Bishop & Babcock
Brown Shoe Co.
Cleve. Electric Illuminating Company
Consol. Car Heating Co.
Fairmont Foods
Farm Tools, Inc.
Gramm Trailer Co.
International Shoe Co.
Jack & Heintz
National Carbon Co.
Omar Baking Co.
Pesco Products Co.
Richman Bros. Co.
Sharon Steel Corp.
Sherwin-Williams
Southern Mills Corp.
Talon, Inc.
Tinnerman Products
Viking Air Conditioning
Ward Baking Co.
Welch's Grape Juice

INSTITUTIONS
Baptist Orphanage of Va.
Meyer Memorial Hospital
St. Clair Convent
St. Vincents Hospital
Woodbine Colony (N.J.)

SCHOOLS & COLLEGES
Berkeley (Cal.) High School
Canton (O.) Public Schools
Detroit High Schools
Lakewood (O.) Pub. Schools
St. Ignatius High Schools

LAUNDRIES
Mullaire Dry Cleaning Co.
Palmetto Cleaners & Dyers
Troy Laundry
Universal Cleaners & Dyers
West-End Laundry

HOTELS & APARTMENTS
Commodore Hotel
Fairhill Apartments
N.Y.C. Housing Authority
Onondaga Hotel
Penn Lincoln Hotel

GREENHOUSES
Glauser Greenhouses
Heinrick's Greenhouse
Kraushaar Bros.
Martin's Greenhouse
Walter J. Engle

PUBLIC BUILDINGS
Delta Air Lines
1st Nat'l Bank, Buffalo
Ohio Farm Bureau, Inc.
Reno Post Office
San Diego Post Office

COMMERCIAL BUILDINGS
A. & P. Co.
Cadillac Sales & Service
Kroger Co.
S. S. Kresge Co.
Sears Roebuck Co.

COMBUSTION INSTRUMENTS & CONTROLS FOR EFFICIENCY AND ECONOMY
CLEVELAND FUEL EQUIPMENT CO.

CLEVELAND FUEL EQUIPMENT CO.
Complete Line of Combustion Instruments and Controls
7316 ASSOCIATE AVENUE • CLEVELAND 9, OHIO

New ILG type "PRV" power roof ventilator

Model "PRV"
Power Roof Ventilator
(Centrifugal Fan Type)

ILG
REG U S PAT OFF

VENTILATION

● Rarely has a ventilating product received as enthusiastic a reception from architects, engineers, and contractors as this new, improved model "PRV" Power Roof Ventilator. It has every desirable feature for positive, controlled ventilation, independent of wind or weather conditions. In a single, weather-tight housing (easy to install, easy to service) you get a complete ventilating unit consisting of self-cooled motor direct-connected to non-overloading, backward curved wheel, plus a selection of air control accessories. No belts, no pulleys, no "extras"! Sturdy, rugged, precision-built, it is available in sizes providing exceptional air deliveries over an unusually large range of pressures (free air to 1½" SP). Each ventilator is backed by the ILG "One-Name-Plate" Guarantee since the complete unit, including the motor, is designed, manufactured and tested within the ILG plant.

To get complete engineering data on this remarkable new development, call nearby Branch Office (consult classified directory) or send coupon today.

Free! New engineering data bulletin No. 1901 gives you the complete story—features, sizes, capacities, dimensions. Send coupon now!

☐ Send free bulletin No. 1901

*Firm Name*_____

*Individual*_____ *Title*_____

*Address*_____ *Zone*_____

*City*_____ *State*_____

How to install better piping

there's a fitting for every copper drainage connection

Here is a representative assortment of cast bronze solder type drainage fittings for every kind of soil, waste and vent connection with ANACONDA Type M Copper Tubes.

Here are the big reasons why ANACONDA Type M Copper Tubes and Cast Bronze Fittings make the best drainage installations:

- **Solder joints are easier, cost less, to make.**
- **Less danger of clogged lines because of smooth bore.**
- **Light weight permits prefabrication of assemblies. A complete copper drainage system weighs only about one fourth as much as one of steel and cast iron.**
- **Copper tubes and fittings require less space. (A 3" diameter vent or soil stack can be installed in a stud partition of standard width.)**
- **Standard twenty-foot lengths reduce number of joints.**

For a catalogue or other information on ANACONDA Copper Tubes and Fittings for drainage, water, or heating lines; write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

5108

nothing serves like **ANACONDA®** **COPPER TUBES**

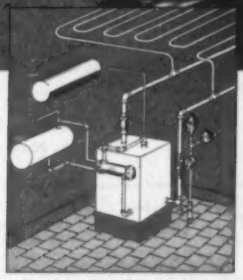
FORCED CIRCULATING FLOW CONTROL HOT WATER HEATING

THRUSH Radiant Heat...

BETTER CONTROL AT LOWER COST

PLEASED customers tell their friends. That's the way to increase business . . . and profit. Forced Circulating Thrush Hot Water Heat, whether you use radiant panels, radiant baseboards, radiators or convectors, is simple, completely automatic, easy to install and low in cost.

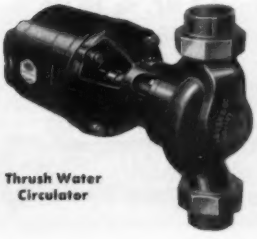
It assures your customers automatic comfort in any kind of weather. There is no fuel waste because there is no over heating. It maintains a constant flow of radiant heat and provides plenty of hot water for kitchen, laundry and bath the whole year through. Get our booklet giving the complete story of Thrush Radiant Hot water heat. Ask your wholesaler about it or address Dept. E-3.



The Complete Forced Circulating Thrush Flow Control System of Hot Water Heat

No. 201 Radiant Heat Control

Thrush Flow Control Valve with Air Vent Tube



Thrush Water Circulator

Thrush Hot Water Heater

IF IT'S CUSTOMERS YOU WANT

...then start now and install

BRUNNER SINCE 1906 AIR CONDITIONING

Last year we increased our production schedules on Brunner Self Contained Air Conditioners three times—*demand was triple that for which we had planned.*

This more than anything else we can tell you, proves that in a highly competitive market, Brunner units offered more of what the buyers wanted.

When a prospect asks what you have to offer it's a mighty satisfying feeling to say "Brunner," then proceed to show him design features that even a layman can understand will deliver air conditioning values which more than justify the investment.

There is no reason why you should sell the hard way—sell BRUNNER. It costs nothing to listen so use the coupon to make a date.

BRUNNER MANUFACTURING COMPANY
Utica 1, New York, U. S. A.

Tear out and Mail!

I'm willing to do more business. Have your factory field representative stop in and bring me up-to-date on what Brunner has to offer me as a dealer. Send current catalogs in the meantime.

Name _____

Company _____

Address _____

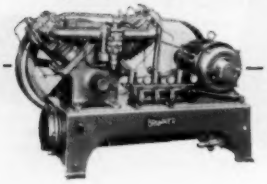
City and State _____

BRUNNER SINCE 1906

AIR CONDITIONING

- **Self Contained 3 HP. to 10 HP.**
- **Remote Type 3 HP. to 75 HP.**

Completely Brunner built... backed by a fine reputation forty-five years old.



REFRIGERATION CONDENSING UNITS by
AIR AND WATER COOLED MODELS—*a size and type for every purpose...*¼ **HP. TO 75 HP.**

BRUNNER SINCE 1906

Good workmen + good tools + GOOD PIPE = GOOD JOB!

7 POINTS OF UNIFORM GOODNESS IN YOUNGSTOWN STEEL PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

ON the job or in the shop, you like to work with Youngstown pipe. Cutting is clean, fast and easy because Youngstown pipe is uniformly round and soft--true to size, even in grain structure, free of inclusions and hard spots. The name Youngstown, rolled into every length, means GOOD PIPE.

QUALITY YOUNGSTOWN SERVICE

Youngstown STEEL PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

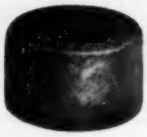
General Offices — Youngstown 1, Ohio

Export Office-500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - HOT AND COLD FINISHED CARBON AND ALLOY BARS - RODS - SHEETS - PLATES - CONDUIT - RAILROAD TRACK SPIKES.

Toothed Lock Washer: Prevents loss of stem nut due to vibration, thereby holding the handwheel securely.

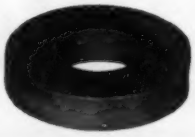
Newly Designed Handwheel: Air-cooled, finger grip handwheel affords sure grip even with greasy gloves.



Improved Packing: Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure.

Hexagonal Union Bonnet Connection: Eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and assembled.

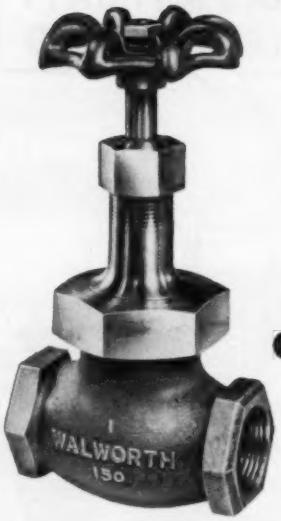
New Cylindrical Disc Holder: The design of the top portion of the disc holder keeps the disc accurately guided under all operating conditions.



Renewable Asbestos Disc: This disc is suitable for steam up to 500F and is resistant to oil, gasoline, and many chemicals at atmospheric temperatures. Discs for special services are available.

Extra Strong Body: Made of Composition M (ASTM B61) bronze thick enough to provide a high safety factor. Valves undergo hydrostatic shell test of 450 psi.

WALWORTH



IMPROVED
No. 95
BRONZE
GLOBE VALVE

also available in Angle Type (No. 96)

The service ratings of the Walworth No. 95 are 150 pounds per square inch steam at 500F, and 300 pounds per square inch non-shock cold water, oil, and gas. In the manufacture of this quality bronze valve, more than 47 gages are used in machining parts to micrometric accuracy, thus insuring interchangeability of parts. For further information see your local Walworth distributor, or write: Walworth Company, 60 East 42nd St., New York 17, N. Y.

note these 7 Great Features

WALWORTH
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Get All-Around Motor Protection with

SAFETY-CIRCLE

THAT SOLID CAST IRON FRAME protects *Safety-Circle* working parts against physical damage from every angle. The completely enclosed bottom provides extra protection and extra strength. End brackets are drip-proof at no premium.

Because the frame is cast iron, it is resistant to rust and corrosion. It withstands physical abuse and will not distort.

Protected Inside, Too

Safety-Circle protects against internal breakdown with multiple-dipped and baked stator and die-cast aluminum rotor. *Ball bearings are factory-lubricated and need no attention for years.* Wide open internal construction and large fans keep temperatures well within rated limits.

Don't be satisfied with a motor that gives you less than full protection. Insist on the extra protection of *Safety-Circle*.

For complete details on *Safety-Circle* advantages, see your A-C Authorized Dealer, Sales Office, or write for Bulletin 51B6210B. Sizes from 1 to 20 hp, 326 frames and smaller.

A-3145

Safety-Circle, Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS, 1171A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

reasons why

FOR THE MAN WHO HAS TO SPECIFY

To the man with the responsibility of choice comes the daily problem of getting the right equipment for specific requirements. More and more of these men are finding that AAF has a keen appreciation of their needs. This is evidenced by a line—largest in the world—that is engineered to meet particular needs. It isn't necessary to make-do . . . AAF provides many different types of air treatment units, many different sizes and capacities, many times better in engineering refinements to *solve your problems.*

Whether you happen to be specifying for a factory, department store or school building, consider the products of AAF and the Herman Nelson Division. They are engineered and built to make life easier for the man who has to specify.

AAF

American Air Filter

COMPANY INC.,

HERMAN NELSON DIVISION

herman nelson

PLANTS: LOUISVILLE, KENTUCKY MOLINE, ILLINOIS

AAF OFFERS ELECTRONIC PRECIPITATION

- To capture the smallest of particles, down—way down, on the micron scale.
- In three distinct types—automatic, washable and dry types.
- A wide range of sizes to meet all space and capacity requirements.

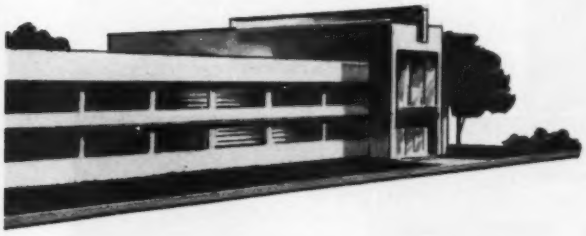
AAF OFFERS ALL TYPES OF AIR FILTRATION

- To provide clean air for all practical purposes.
- In many types including automatic, viscous and dry types; washable, replaceable and renewable, viscous and dry type units.
- Wide selection of sizes and capacities to meet all air cleaning requirements.

Whatever the need for clean air, whenever you specify air cleaning equipment, remember AAF offers selective air filtration based on long-term experience. For consultation on air treatment problems or specific data for your files, write to the address below.

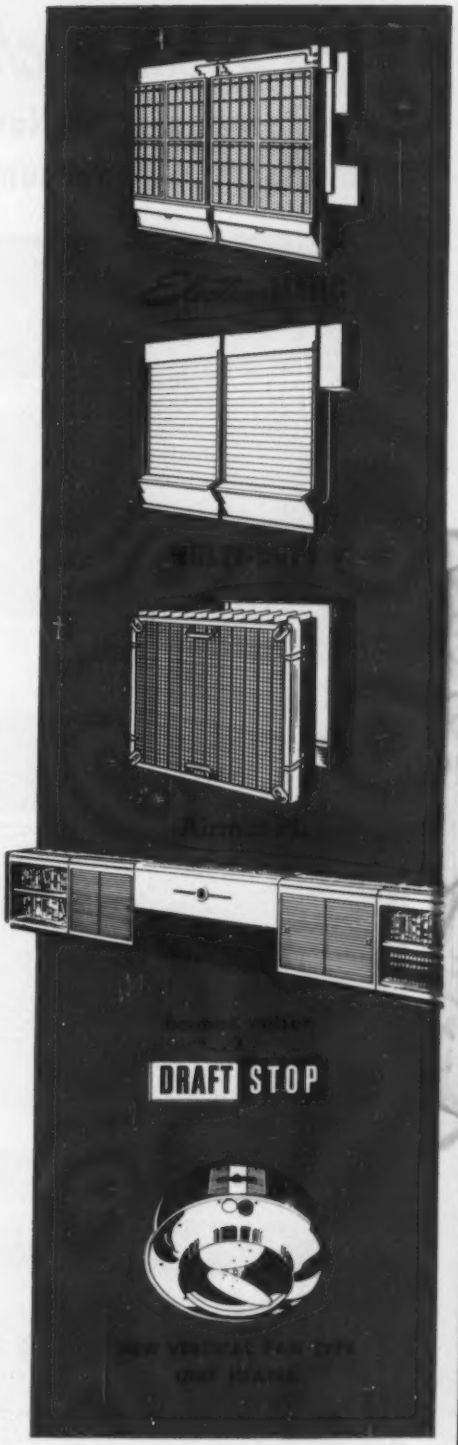
NOW WE OFFER A WAY TO END "DRAFT ROW" IN THE CLASSROOMS

With Herman Nelson's introduction of the DRAFT|STOP System classroom ventilation is absolutely revolutionized. By trapping drafts at the source, introducing fresh air and maintaining healthful temperatures automatically, pupils avoid one threat of illness, are actually more receptive to teaching. This most-modern, most-advanced method of keeping classroom air in the best of condition for health and comfort is available now. Specify DRAFT|STOP for every school you plan.



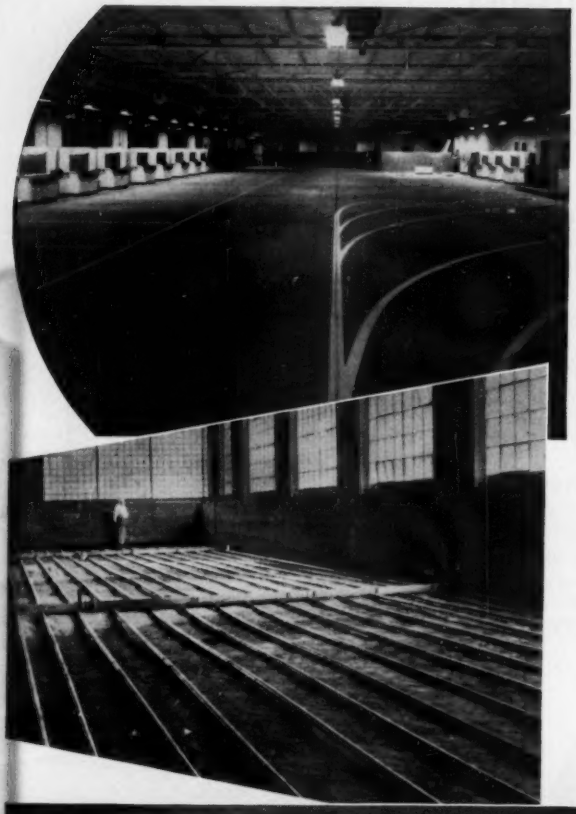
LIKE NEW THINGS WITH OLD-FASHIONED VALUE?

Here's the new Vertical Fan-Type Unit Heater. It's built to the same standards of value that have won Herman Nelson a reputation for quality heating products. For steam and hot water, its rugged construction means long economical service. Request detailed information on our complete Herman Nelson Unit Heater line.



Here's a real "mechanic's garage"

radiant heating with National Steel Pipe assures warm floors . . . maximum comfort . . . at low cost



● The Kuykendall Chevrolet Company garage, in Lubbock, Texas, is skillfully designed with two important things in mind: High efficiency, for low operating cost; and maximum comfort, for higher worker output.

You can't beat radiant heating for attaining such results. It provides warm floors and uniform, comfortable temperatures throughout—ideal for garage work. Radiant heating eliminates above-floor heating units and makes the entire working area available. There are no obstructions, no hot spots, no cold areas or damp floors to handicap operations. These advantages have lead to the increasing use of radiant heating in modern garage construction.

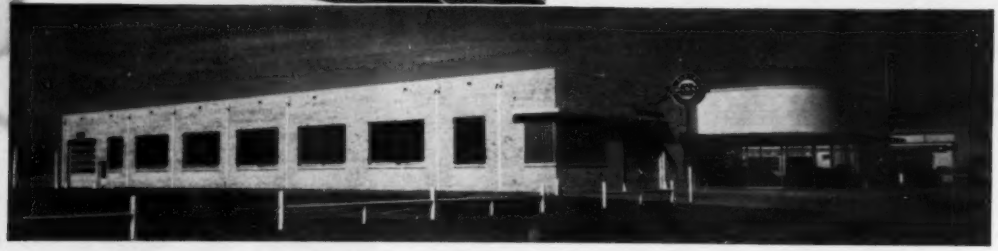
Steel pipe is unequalled for radiant heating installations. It's strong and ductile for easy bending. It's ideal for making welded joints. And steel pipe is so strong that it's hard to damage during installation. Best of all: it's durable in service and economical to use. When you buy National Steel Pipe, you're buying the same reliable steel pipe that has been the standard for conventional heating for more than sixty years.

If you are planning a radiant heating installation in a garage, store, terminal, factory, warehouse or plant, be sure to get all the advantages of using National—world's largest selling pipe.

Write today for our free 48-page book on Radiant Heating. It includes data for estimating heat losses, designing coil systems for floor and ceiling installations, typical coil patterns, testing procedures, fitting resistances, insulating techniques, pipe data and heat transmission tables. Ask for Bulletin No. 19. National Tube Company, Frick Building, Pittsburgh 19, Pa.

NATIONAL TUBE COMPANY, PITTSBURGH, PA.

COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



USS

NATIONAL Steel PIPE

UNITED STATES STEEL

R·P&C VALVES

NO. 6056
Forged
Steel
Gate Valve

Here is a Premium Valve
that is NOT premium priced

CHECK THESE DESIRABLE FEATURES:

- Bolted bonnet construction
- Heat-treated and hard chrome plated stainless steel wedge
- Stainless steel gland eye-bolts and nuts
- Two-piece gland and follower
- Tongue and groove bonnet joint

It's well designed. It's low priced in its field.

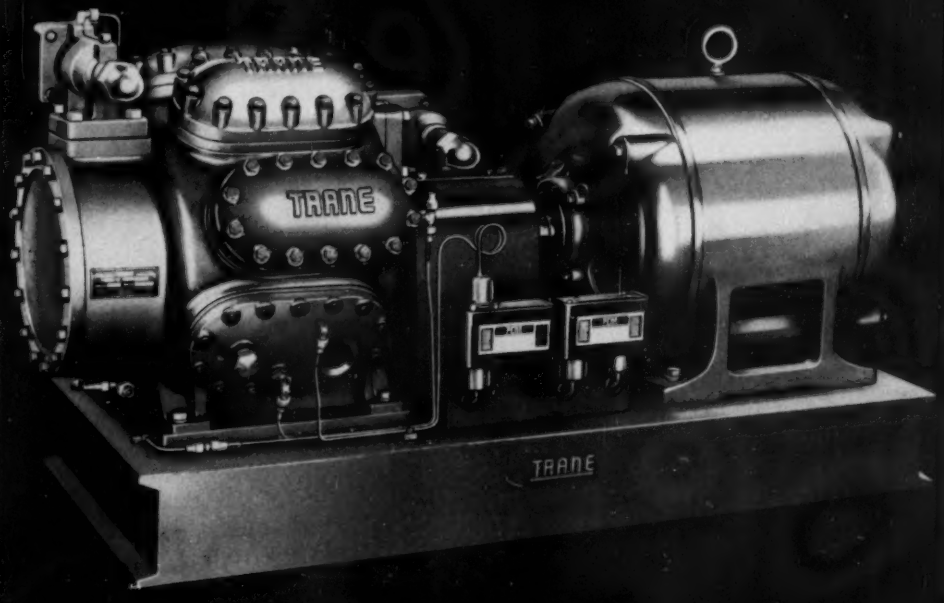
See your R-P&C distributor or write nearest R-P&C district office.

"Intentionally Better"
READING-PRATT & CADY VALVES

R-P & C VALVE DIVISION
AMERICAN CHAIN & CABLE

NEW TRANE COMPRESSOR...

New internal capacity control...new force feed oil system...new compact design



Full information and data on the new Trane Compressors available at your nearest Trane Sales Office, or at the main office in La Crosse, Wisconsin. See Reciprocating Compressor Bulletin DS-361

NEW REFRIGERATION EFFICIENCY

Saves space, cost, service on comfort and process applications

Brand new, all new, the Trane Reciprocating Compressor is designed to set a new high in refrigerating efficiency, performance and endurance.

The trim and compact Trane Compressor Unit is a real power-saver in operation. With its completely new, completely enclosed capacity control system, power consumption is reduced under reduced cooling loads. Trane Compressors automatically respond to load changes with favorable tonnage-to-horsepower efficiency even under greatly reduced loads. This smooth-running step-down and step-up operation requires no outside controls or adjustments.

Direct drive, constant speed design, plus unloaded starting, permit the use of standard general purpose motors. Special large-area filters cut wasteful oil foaming and pressure losses during start-up periods.

The new Trane Compressor is built for extra years of trouble-free service. Specially treated suction and discharge valves are designed to wear 900% longer; on test, needed no attention after the equivalent of 8 seasons of continuous operation. Bearings serve *years* longer because of an enclosed forced feed lubrication system. This system sends clean oil to bearings and prevents impurities from reaching bearings.

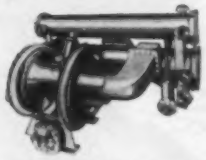
When it comes to quiet, vibration-free performance, the new Trane Compressor is a standout again. Special Trane designed valves are cushioned to muffle noise at its source. The internal capacity control system operates through oil pressures, silently and effectively.

So smooth running is the Compressor that a penny can be balanced on the machine through all stages of its operation!

The new Trane Compressor is available in six compact models, with 4, 6 or 8 cylinders. Capacities range up to 50 tons.

The new improved Compressor makes it easier and more logical than ever to design a complete air conditioning system around Trane products. Trane Fans, Coils, Climate Changers (for a central system), Custom-Air and UniTrane units (for a unit system), and Trane Compressors can work together to supply year-around comfort in any building. Individually, each of these products is outstanding. Working together, they are unmatched for air conditioning efficiency.

For full information about the new Reciprocating Compressor and Condensing Units, see the Trane representative in your area, or write the main office, La Crosse, Wisconsin.



The New CenTraVac, a complete hermetically-sealed water chilling system, brings centrifugal refrigeration economies to a new and wider range of jobs. Direct drive, with automatic power reduction that parallels capacity reduction. Capacities starting from 45 tons. CenTraVac Bulletin DS-399 gives full information.

The 1951 Trane Self-Contained Air Conditioner supplies year-around comfort for stores, restaurants, offices. Uses less floor space. Delivers comfort directly or through ducts. Accessible hermetic compressors. Unit capacities up from 3 tons. See Self-Contained Air Conditioner Bulletin DS-362 for complete data.

The Trane Climate Changer is a complete year-around air conditioner, heating or cooling, humidifying or dehumidifying, filtering and moving air. It can do all, or any combination of these jobs for comfort or process work. Climate Changer Bulletin DS-303.

Luxury air conditioning for a luxury hotel—every room in the famous Shamrock Hotel in Houston is an oasis of air conditioned comfort. Trane-built room units form the system supplying this comfort.

TRANE

THE HOUSE OF WEATHER MAGIC

THE TRANE COMPANY, LA CROSSE, WISCONSIN
EASTERN MFG. DIVISION • SCRANTON, PA.
TRANE COMPANY OF CANADA, LTD., TORONTO

MANUFACTURING ENGINEERS OF HEATING AND AIR CONDITIONING EQUIPMENT • OFFICES IN 80 CITIES

...and the new Baltimore Airport

Architects and Engineers:
Whitman, Requardt, Greiner & Associates, Baltimore, Md.

Heating, Plumbing and Air Conditioning Contractor,
Lloyd E. Mitchell, Inc. Baltimore, Md.

is ALL-SARCO

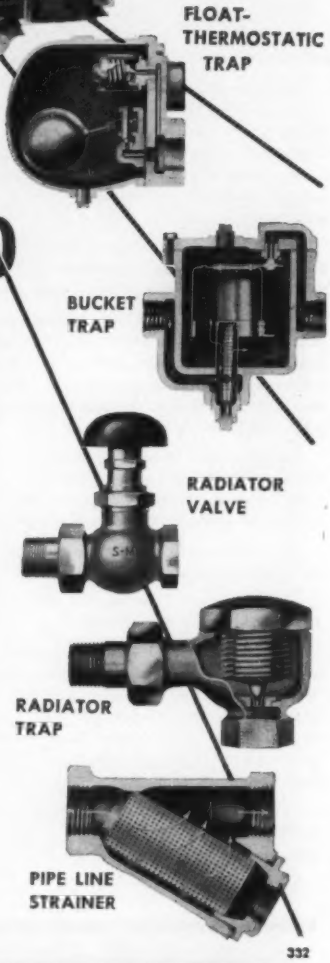
Friendship International Airport with a landing runway of 9,450 feet is the largest civilian runway on the eastern seaboard. The Administration Building alone occupies more than an acre of ground and is a combination office building, terminal and hotel, with roomettes, showers and dressing rooms for hold-over passengers.

Years of planning preceded its construction. And after mature consideration the heating engineers selected more than 1000 Sarco accessories to keep the operation reliable, satisfactory and efficient from a fuel consuming standpoint.

They decided to standardize on SARCO. Not on one type of trap —but three different types, each used in its proper place. Sarco radiator traps and valves, of course. Then various forms of the Sarco float-thermostatic trap for drips, risers and unit heaters, and Sarco bucket traps for the water heaters.

Then to insure continuous operation, Sarco pipe line strainers were placed at all important points.

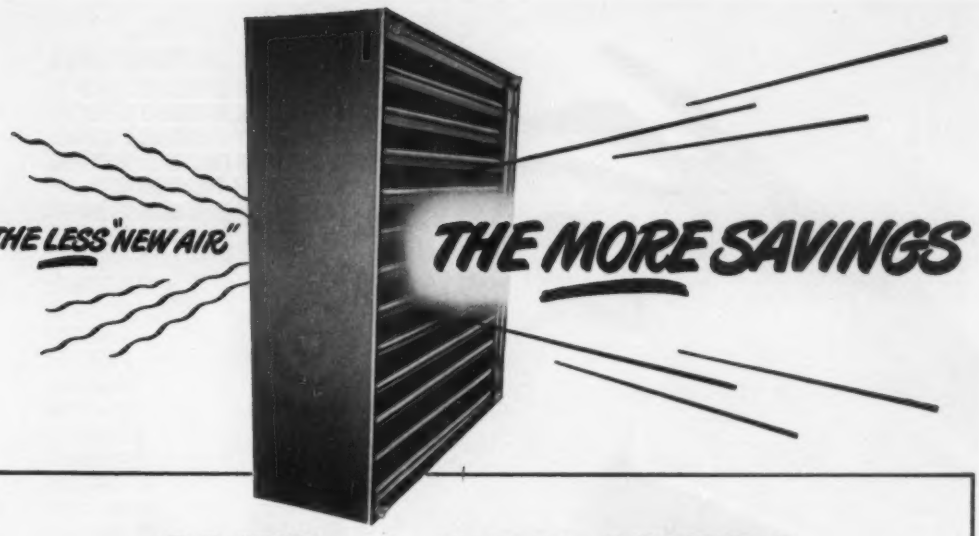
FOR YOUR PLANT: You may need an entirely different selection from the many types and sizes of Sarco steam traps and temperature control. Certain it is that the Sarco Representative near you can understand your needs and suggest the combination which will give you utmost heating satisfaction for years to come at lowest heating costs.



332

SARCO SAVES STEAM
IMPROVES PRODUCT QUALITY AND OUTPUT

SARCO COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO



OVER 6,000 USERS

Save Millions

WITH

DOREX AIR RECOVERY

With Dorex C Cells in an air conditioning system, the volume of new, outside air that must be taken in can be reduced by as much as two-thirds. Thus, cost of original equipment and operating costs are both materially lower.

These facts are of great importance to economy-minded industry today.

It costs over $200 a year to condition every thousand cubic feet of new air circulated per minute. But Dorex Air Recovery "manufactures" fresh air for less than half this cost. Dorex Air Recovery is backed by more than 20 years of experience . . . the biggest names in American business are Dorex users. With Dorex Air Recovery you have more to offer your clients.

Get the complete story of Dorex Air Recovery—technical details, actual savings made, list of users. Write today for Bulletin 117-C.

DOREX
Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut

Air Diffusion • Air Purification • Air Recovery

In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. A-31, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

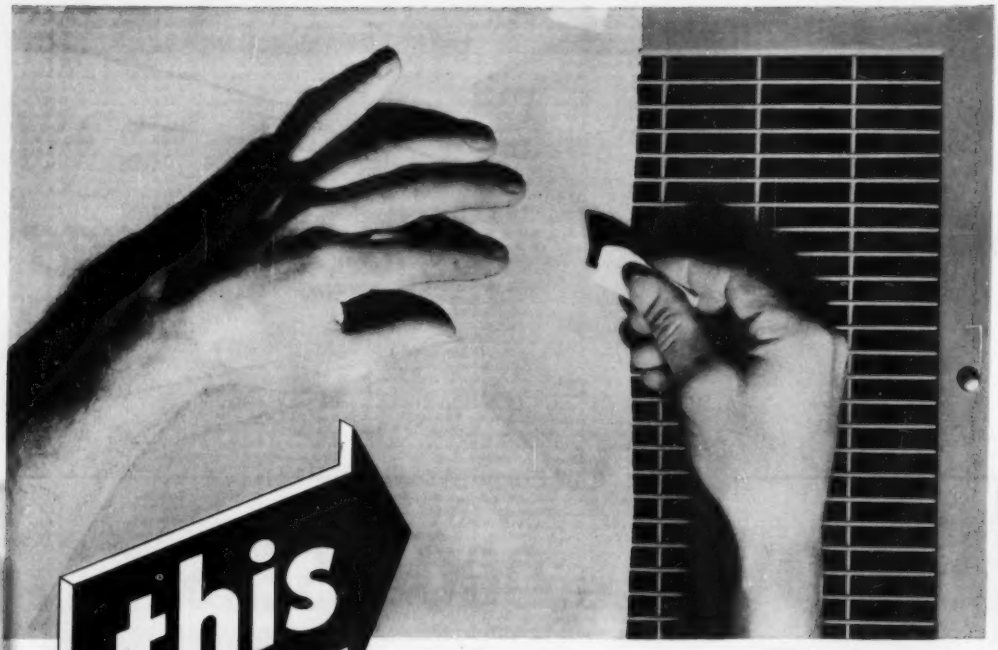
Name.....

Position.....

Company.....

Street.....

City..... Zone..... State.....



is as bad as dirty filters!

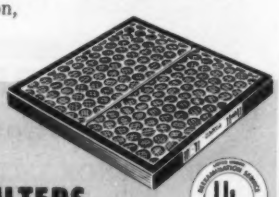
Get This Booklet—The "Comparative Study of Air Filtering Costs" contains facts, figures and charts important to anyone interested in air conditioning. A copy free on request. Write today.

You wouldn't deliberately block your air conditioning registers. And yet, leaving in dirty filters is just as sure a way to cut air flow—decreasing comfort and raising operating costs.

Regular, periodic replacement of air filters is a *must* if you want efficient air conditioning and low maintenance costs. How often should you replace them? As often as they get dirty . . . and that depends on your local conditions . . . in some cases as often as once a month.

Be sure your filter replacement is handled on a definite schedule, using nationally known and accepted Fiberglas Dust-Stop* Air Filters, the replacement filters that provide high dirt-catching capacity at no extra cost.

Your Dust-Stop supplier can help you set up a way of handling filters systematically. Discuss it with him today. Owens-Corning Fiberglas Corporation,
Dept. 40-C, Toledo 1, Ohio.



OWENS-CORNING
FIBERGLAS

DUST STOP* AIR FILTERS

*T. M. REG. U.S. PAT. OFF.

*Dust-Stop is the trade-mark of Owens-Corning Fiberglas Corporation for impingement-type air filters made of fibers of glass. FIBERGLAS is the trade-mark (Reg. U.S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with fibers of glass.

plumbers builders and home owners

profit by installing

Streamline®

ALL COPPER SUPPLY AND DRAINAGE PLUMBING

plumbers

The net profits on a STREAMLINE all-copper rough-in are substantially better than on a ferrous system when installed by experienced mechanics. Solder joints make installation much easier, and besides, copper plumbing is in demand by builders and home buyers.

builders

The permanence of a STREAMLINE copper system appeals to home buyers. It costs no more, installed, than a rustable ferrous system. It eliminates complaints because it is permanently trouble-free!

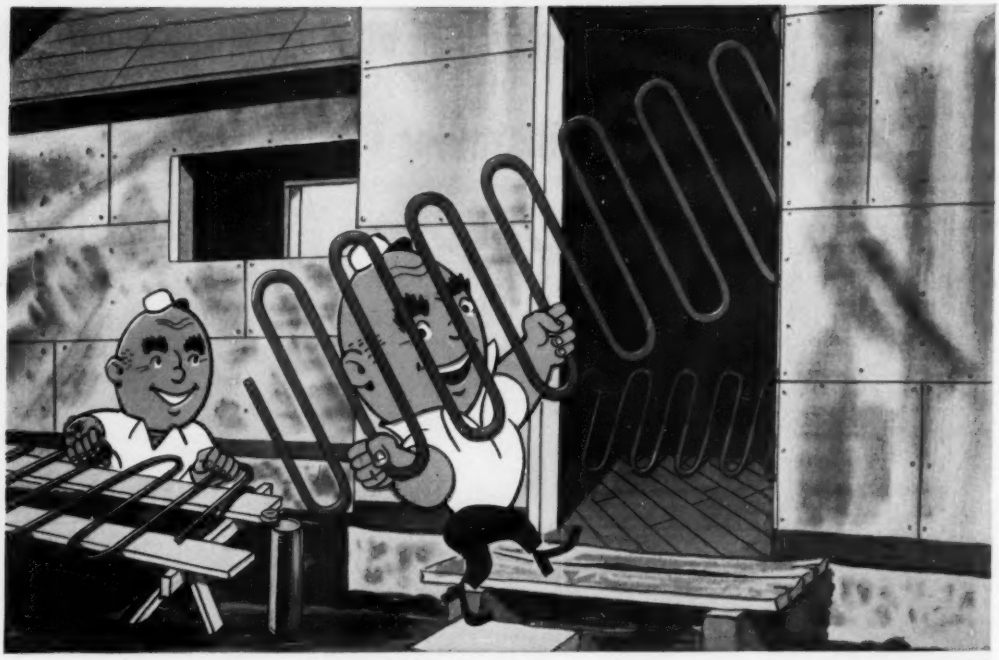
home owners

Copper plumbing protects the owner's investment—the resale value of the building is actually better! At no extra cost the owner gets what he wants—a modern, dependable system—rust proof and virtually clog-free.

Copper is already on the critical list. For civilian purposes it will not be as generally available as we would all wish it to be. To get further information see your plumbing jobber. For illustrated product literature write for Catalog S-351 and W-250 describing the complete line of cast supply and drainage fittings and the complete line of wrought fittings through 4".

MUELLER BRASS CO. STREAMLINE PRODUCTS

MUELLER BRASS CO., PORT HURON 1, MICHIGAN



Bundyweld . . . right in your homes for better radiant heating

Unique construction, unique advantages—that's why!

Bundyweld is the only tubing double-walled from a single strip. It's extra-strong. Copper-brazed through 360° of wall contact, it's leakproof. It's double-walled, yet thinner-walled . . . *right* for faster-heating, more effective systems in your houses.

It's *right* for easier handling, too, on your building site. From its arrival in twenty-foot lengths (one end expanded when specified) to final installation in your ceilings, walls, or floors, tough Bundyweld rides over jolts, knocks, and jars. On a simple fixture, one man easily bends ductile Bundyweld to short radii, with no danger of structural collapse. Formed grids are easily joined, joined grids quickly positioned.

Briefly, when Bundyweld goes to work on your job, time, labor, materials savings, and better all 'round radiant heating go with it. Check Bundyweld today. For details, see *Sweet's Architectural File.* Or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

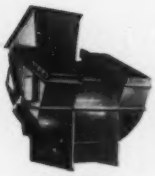
passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

American Blower—a time-honored name in air handling

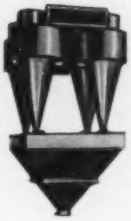
Venturafin Unit Heaters



Mechanical Draft Fans

Utility Sets

Ventura Ventilating Fans

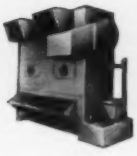


Dust Collectors

Air Washers

Industrial Fans

Heating and Cooling Coils

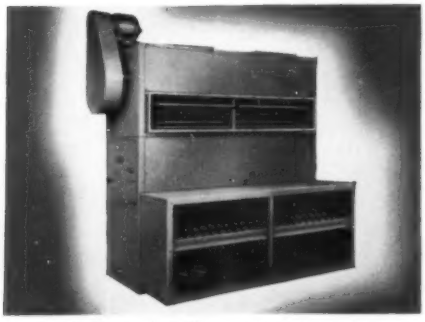


Air Conditioning Equipment

Look before you buy and you'll buy American Blower products. All air handling equipment is not alike. There's a big difference in quality, design, and quietness, as well as in operating costs and efficiency. The superiority of American Blower products has been proved in test after test by buyers.

In Chicago, as in other cities, American Blower Air Handling Products have been serving commerce, industry and public utilities for over half a century. For air handling data in the Chicago area, call American Blower — FINANCIAL 6-2531. In other areas consult your phone book.

Product of the month



American Blower Type A Conditioner. Capacities from 1000 to 13,600 cfm.

Control the weather in your business!

American Blower Air Conditioning units are designed for summer cooling and dehumidifying and winter heating and humidifying.

This dual function by the same piece of equipment results in substantial savings in cost and offers much in comfort.

Three types are available: the Type A Conditioner for normal unitary type commercial and industrial applications, the Type S Conditioner for unitary type application where washed air is desired or where high relative humidities are required, the Type M Conditioner for central system installation using duct systems. The Type M is ideally suited for industrial process applications where high air resistance makes the unitary type impractical.

For data, consult the nearest American Blower Branch Office.

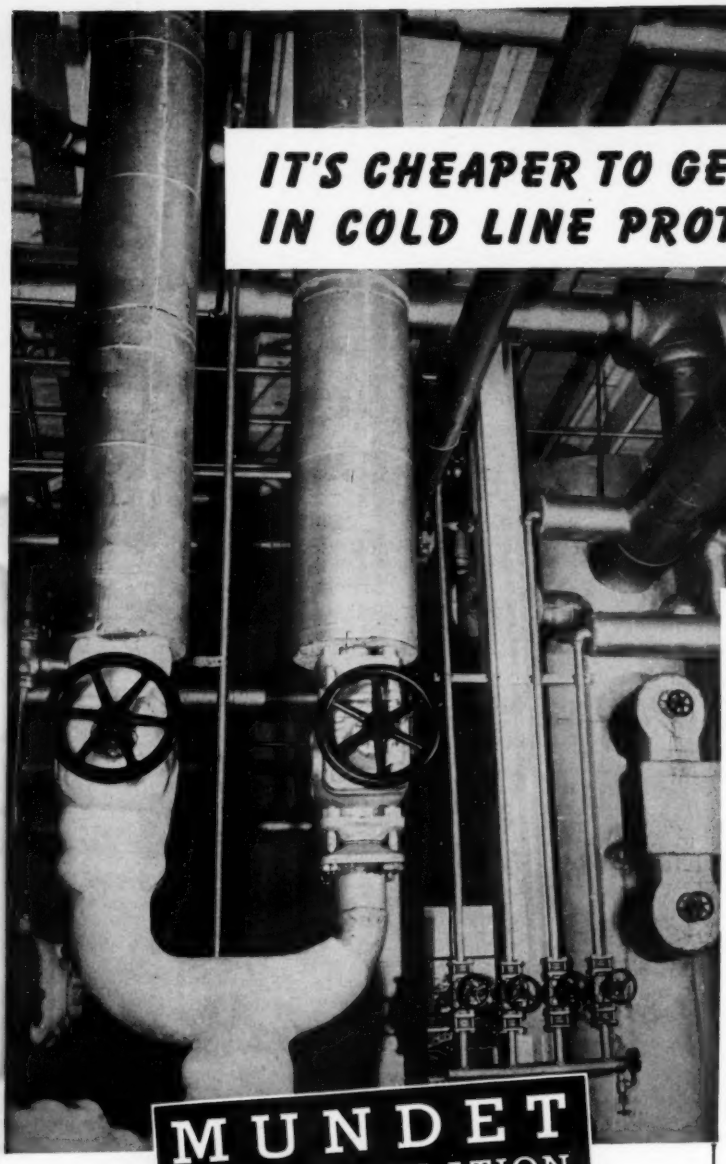
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON



IT'S CHEAPER TO GET THE BEST IN COLD LINE PROTECTION . . .

For all applications of refrigeration, Mundet Cork Pipe Covering quickly repays its cost . . . frequently within 8 months to a year of the installation. Mundet district offices are competently staffed with men who specialize in low temperature applications. They will be glad to help you solve your air conditioning problems.

Mundet district offices are conveniently located coast-to-coast.

ATLANTA
339-41 Elizabeth Street, N.E.

BALTIMORE 30
612 Battery Ave.

BOSTON
57 Regent St., North Cambridge 40

CHARLOTTE, N. C.
507 S. Cedar Street

CHICAGO 16
2601 Cottage Grove Avenue

CINCINNATI 2
427 West 4th Street

DALLAS 1
601 Second Ave.

DETROIT 21
14401 Prairie Street

HOUSTON 1
Commerce and Palmer Streets

INDIANAPOLIS
15 E. Washington St.

JACKSONVILLE 6, FLA.
800 E. Bay St.

KANSAS CITY 7, MO.
1401 St. Louis Avenue

LOS ANGELES
(Maywood)
6116 Walker Avenue

NEW ORLEANS 16
315-25 N. Front Street

NEW YORK 17
331 Madison Ave.

PHILADELPHIA 39
856 N. 48th Street

ST. LOUIS 9
3176 Brannon Ave.

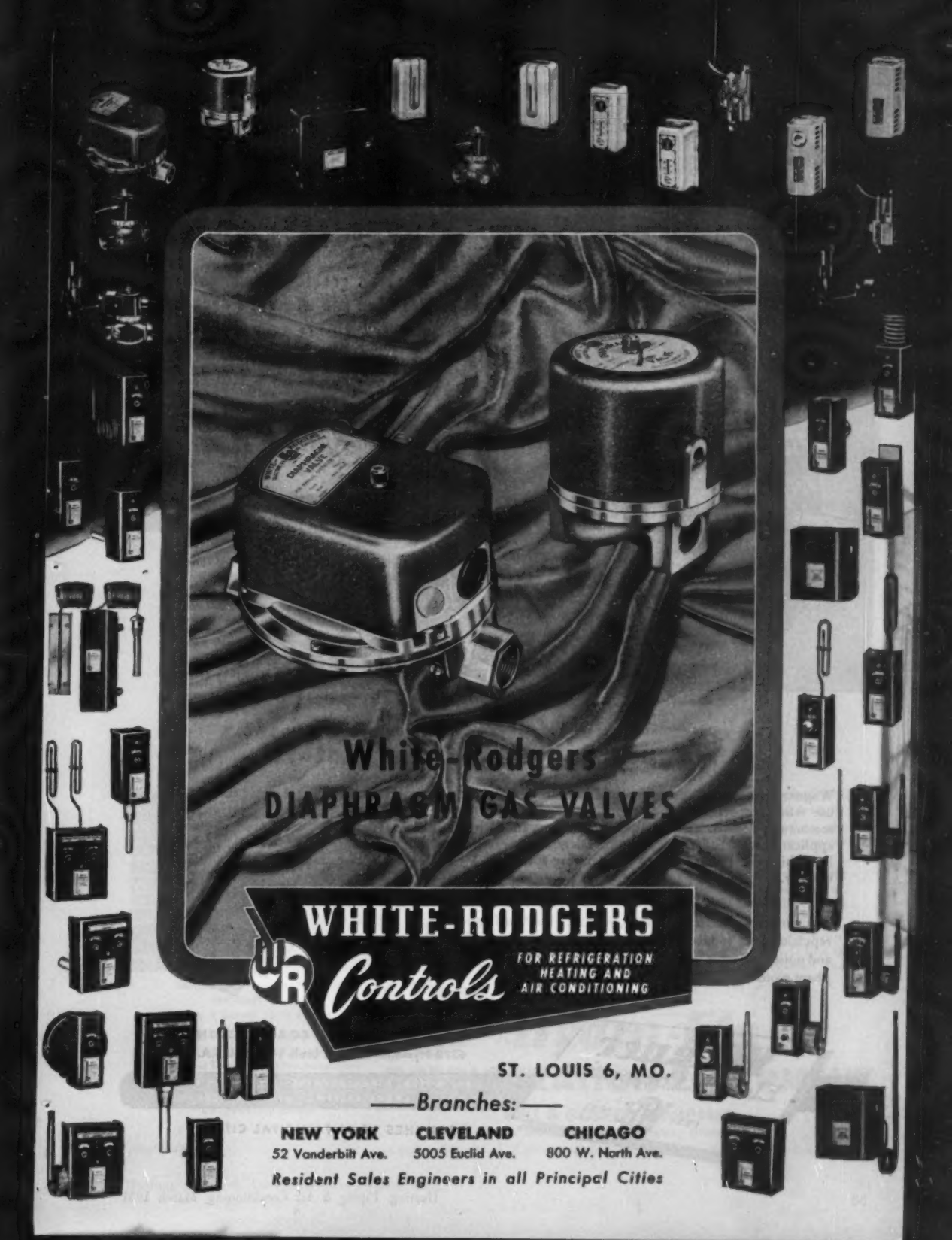
SAN FRANCISCO 7
440 Brannan Street

In Canada:
Mundet Cork & Insulation, Ltd.
35 Booth Avenue, Toronto

MUNDET
CORK INSULATION

Mundet Cork Pipe Covering provides the essentials of most effective insulation: low thermal conductivity; non-absorbence; sanitation and permanence. Write for specification information, heat loss charts and other helpful data. Inquiries receive prompt attention. Mundet Cork Corporation, Insulation Division, 7101 Tonnelle Ave., North Bergen, N. J.

CORK PIPE COVERING • CORKBOARD


White-Rodgers
DIAPHRAGM GAS VALVES
WHITE-RODGERS
WR Controls
FOR REFRIGERATION HEATING AND AIR CONDITIONING
ST. LOUIS 6, MO.
—Branches:—
NEW YORK
52 Vanderbilt Ave.
CLEVELAND
5005 Euclid Ave.
CHICAGO
800 W. North Ave.
Resident Sales Engineers in all Principal Cities

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

it *pays* to be particular about your choice of motors

Choose Wagner Motors for...

longer life . . . greater dependability and *service when and where it's needed!*

The selection of the *right* motor to power your product is all important. Uniform troublefree performance, dependable long-life operation, the reputation of the manufacturer, and his ability to provide immediate repair parts and service — *when* and *where* they're needed, are all factors that mean satisfied customers for you. You'll save time, money, and worry if you choose from the Wagner line because:

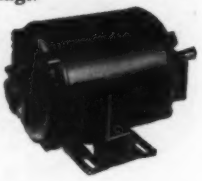
1. Wagner Motors are backed by a liberal warranty.
2. They are available in a wide range of types and sizes for every application.
3. Improved engineering features assure long life and efficient operation.
4. They are available from Wagner Branches in all principal cities.
5. More than 650 Wagner Authorized Service Stations and Parts Distributors plus 25 Wagner-owned Service Branches provide on-the-spot service, replacement motors, or genuine repair parts.

Regardless of what your motor requirements may be, Wagner can furnish the *right* motor to fit your need. Bulletin MU-185 gives complete information—write for your copy.

Wagner Capacitor-Start Motors

Wagner type RK motors are your best choice for use where capacitor-start fractional horsepower motors are desired. They are designed for use in applications where starting loads are fairly heavy, but which can be brought up to operating speed quickly.

They are available with either sleeve or ball bearings; in open or totally-enclosed types, with rigid or resilient bases or with a machined end plate for flange mounting. They are built in ⅛, ⅙, ¼, ⅓, ½, and ¾ horsepower ratings.



If you need motors in larger sizes, you can't beat the famous Wagner single-phase repulsion-start induction motor for low upkeep cost, freedom from vibration and noise, and years of reliable service. It's the standard by which all other single-phase motors are judged.

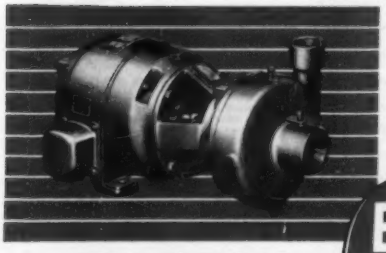
Wagner
Electric Corporation
1891 WE 1951

WAGNER ELECTRIC CORPORATION
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

FEATURING SIMPLIFIED ENGINEERING AND QUICK SELECTION DATA



WHERE CAN YOU MATCH THE FEATURES OF THE B & G SERIES 1522 PUMP?

Leak-proof Mechanical Seal • Spring-type flexible coupling • Hydraulically Balanced Impeller • Interchangeable parts • Compact Design • Standard Motors • Easy Servicing • Competitively priced.

Refrigeration and air conditioning men will find this latest B & G Condenser Manual and Catalog valuable for several reasons:

First, it displays a line of condensers distinguished by the excellent design and construction made possible by a quarter century's experience in heat transfer work.

Second, it presents simplified methods for determining condenser requirements and for making a correct selection of equipment. Send today for your copy of the B & G Condenser Manual—it will make your jobs easier to figure—save your time.

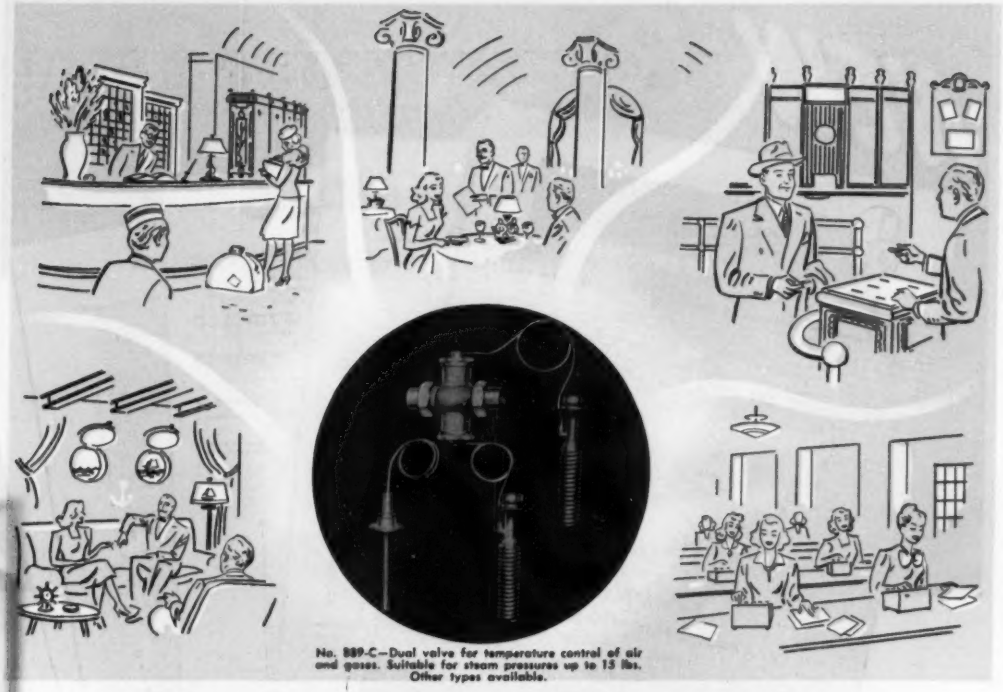
Ask also for catalogs on B & G *Hydro-Flo* Evaporators and Centrifugal Pumps. The B & G line of refrigeration equipment is soundly integrated and worthy of your careful investigation.

Hydro-Flo®
REFRIGERATION EQUIPMENT

BELL & GOSSETT COMPANY
Dept. RBY-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Road, Toronto, Canada

®Reg. U. S. Pat. Off.



No. 889-C—Dual valve for temperature control of air and gases. Suitable for steam pressures up to 15 lbs. Other types available.

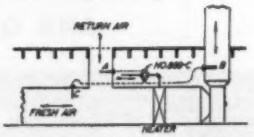
Make every room a Comfort Zone...

with Sylphon control

● Every room can have comfortable, *constant* temperature—easily and thriftily—with Sylphon temperature regulators. These dependable controls are simple, compact, highly sensitive—ideal for hotels, offices, stores, institutions, schools, etc.

One is pictured here—Sylphon Regulator 889-C. It is used for control of duct heating and ventilating systems. It's fully modulating, self-powered. Its packless valve eliminates service problems. No exposed operating mechanism. Simple dial adjustment.

Like all Fulton Sylphon controls, it is built for long life and maintenance-free service. Write for details about Regulator 889-C, or for information on Sylphon Controls for specific air-conditioning, heating or ventilating uses. Ask for Catalog EH.



Typical installation No. 889-C. Heating and ventilating, with recirculation, and high percent fresh air. Dual valve with main and by-pass ports. Space temperature under control of bulb "A" in recirculated air. Bulb "B" in discharge, with weather compensation from bulb "C", provides cold draft (low limit) protection.

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
DIVISION

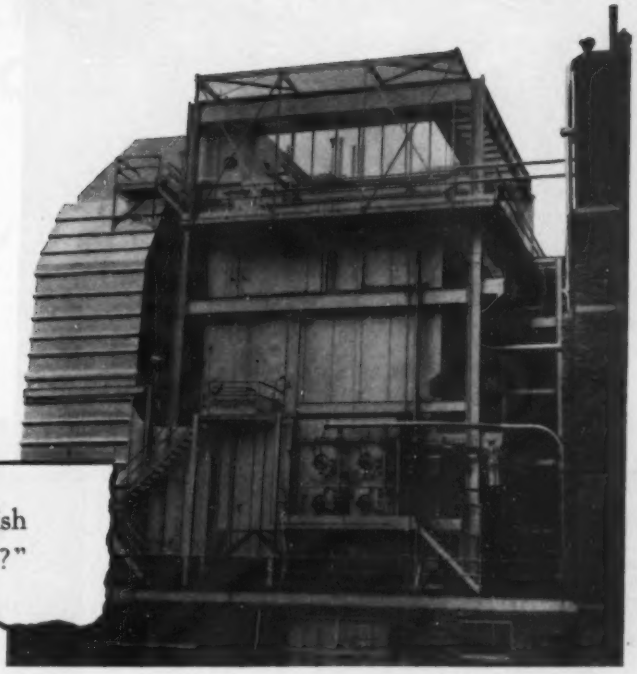
FIRST WITH BELLOWS

ROBERTSHAW-FULTON CONTROLS CO. KNOXVILLE 4, TENN.

Canadian Representatives, Darling Brothers, Montreal

WE HAVE BEEN ASKED:

"What is the best finish for an outdoor boiler?"



A letter we received recently stated:

"We plan to install our new boiler outdoors, and we have a question about the best finish to use. The boiler will be insulated with 85% Magnesia Block. What type of finish would you recommend, taking into consideration both cost and durability?"

We advised two coats of Armstrong's Insulmastic as a finish for this boiler because it is less expensive than many other finishes that are suitable for outdoor applications. Also, it does not crack in cold weather or soften in summer's heat and has unusual durability under wind, rain, and snow. It requires only periodic painting with aluminum or Armstrong's No. 3 Asphalt Paint. However, for best results the Insulmastic must be applied properly.

After the Magnesia Block has been installed, a layer of hexagonal mesh should be secured in place, and one coat of asbestos cement troweled on to an even surface. Next, a second layer of mesh is applied over the plaster and two coats of Insulmastic troweled on to a smooth, even finish. Should the boiler be in a busy area where it might be subjected to damage, it's wise to erect bump rails for protection.

Almost every job presents problems that must be well thought out if the insulation is to be truly effective. Armstrong's engineers are ready to help tailor your insulation specifications to meet your requirements. In addition to the advice of highly trained engineers, Armstrong offers a complete Contract Service with skilled workmanship and highest quality materials.

IF YOU HAVE ANY QUESTIONS on the construction of high-temperature or low-temperature equipment, please do not hesitate to write to us. We'll do our best to give you a practical answer. Just address a letter or post card to Armstrong Cork Company, 4403 Maple Avenue, Lancaster, Pennsylvania.

ARMSTRONG'S INDUSTRIAL INSULATIONS

Lane Bryant

– WHERE THE "ATMOSPHERE" IS ALWAYS RIGHT!

"Buffalo" FANS AND PC CABINETS

PROVIDE THIS *Atmosphere of Comfort*

● Lane Bryant stores are famous not only for their fine merchandise, but for their inviting atmosphere. "Buffalo" Comfort Conditioning Cabinets maintain the air comfort that's part of this "atmosphere", in their beautiful Pittsburgh, Pa. store shown in upper left.

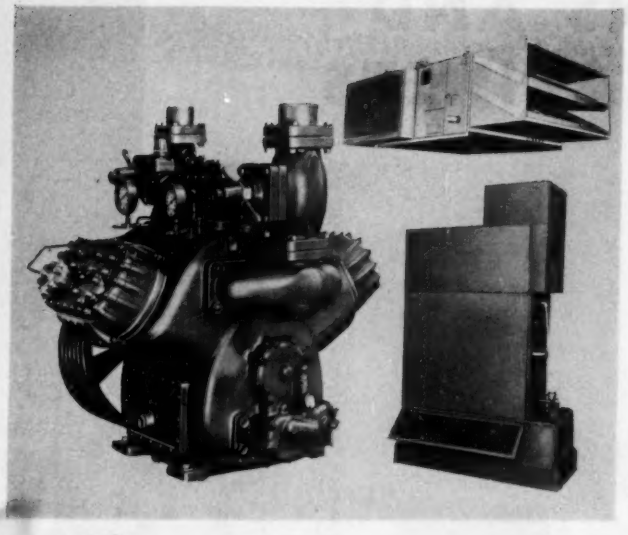
For dependable, year-round air comfort so essential to the operation of any store, plant or public building, specify air handling equipment by "Buffalo", the name known favorably to industry for 73 years.

"Buffalo" builds a complete range of fans, pumps and air conditioning units. You can pick exactly the unit the job calls for, and be sure of "specified results". Write for bulletins on any phase of air handling.

BUFFALO FORGE COMPANY
171 MORTIMER STREET BUFFALO, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in all Principal Cities

"Buffalo" PC Cabinet installation supplying all-weather air comfort to entire Lane Bryant store in Pittsburgh. Unit cleans air continuously, controls humidity and temperature.

"Buffalo" Type "B" Axial Flow Fan, for mounting in straight runs of ducts . . . supplying air to air conditioning equipment, exhausting from hoods over vats, or boosting an existing system. Compact, light, easy to install. WRITE for BULLETIN 3533-C.



Who Makes a COMPLETE Freon Reciprocating System?

A completely integrated and balanced system—all *manufactured*, not just assembled, by the *one* manufacturer—that's Worthington.

No other company makes a wider variety of complete Freon reciprocating systems.

No other company offers more perfectly balanced operation of inter-related components—for lowest costs, longest life.

Worthington Freon-12 Compressors and Refrigeration Units. One basic compressor design covers a size range from 2 to 125 tons, with three cylinder sizes. Simplified construction. Lightweight automotive pistons. Worthington Feather* Valves—simplest, lightest, quietest ever made. Internal manifold. Renewable cylinder liners and leakproof, continually-cleanable force-feed lubrication in larger sizes. Positive manual or automatic capacity control. Available in self-contained compressor-condenser units.

Worthington Air-Handling Units. Perform complete air conditioning functions. Water cooling or direct expansion. Five sizes: 4 to 60 tons, 4000 to 13,500 cfm. Horizontal or vertical. Sectional design.

Worthington Evaporative Condensers. All parts exposed to moisture made of zinc-coated steel, bonderized and coated with rubber-base enamel containing special rust inhibitor. Prime surface—no fins to clog. Staggered coils permit air deflection and complete wetting. Six sizes from 2000 to 27,000 cfm.

Also: *Worthington Evaporative Coolers* in same range.

*Reg. U. S. Pat. Off.

Bulletins containing complete information are available

First Completely Air-Conditioned Apartment House in New England

Beacon Towers Apartments, Brookline, Mass. is the first building of its type in New England to be 100% air-conditioned.

E. A. Berman Company of Boston, under the direction of M. L. Cail, installed a three-zone cooling water system for the 34 apartments. Individual room units are served by a refrigeration unit consisting of a Worthington Freon-12 compressor, evaporative condenser and water chiller.

The system is designed and operated for automatic heating in winter and cooling in summer.

Experience of the owners has been that the air conditioning helped to lease the apartments for 3-year periods.

Laboratory Air Conditioning Duplicates Mill Conditions

Worthington also manufactures a complete line of *centrifugal* refrigeration.

When the W. Harrison Hightower Textile Engineering Building was built at the Georgia Institute of Technology, Atlanta, to house its textile school, Worthington refrigeration for air conditioning was installed to provide the proper temperature and relative humidity required for textile processing.

Fourteen separate rooms are individually air-conditioned, through a chilled water system, from a 150-ton Worthington centrifugal refrigeration system, electrically-driven. This machine is equipped to shut off automatically in the event of trouble anywhere in the system.

Installed by Engineering Contractors, Atlanta, Ga.

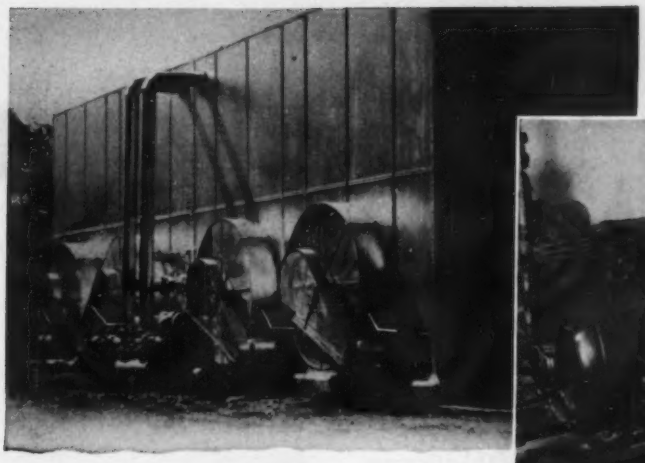
WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

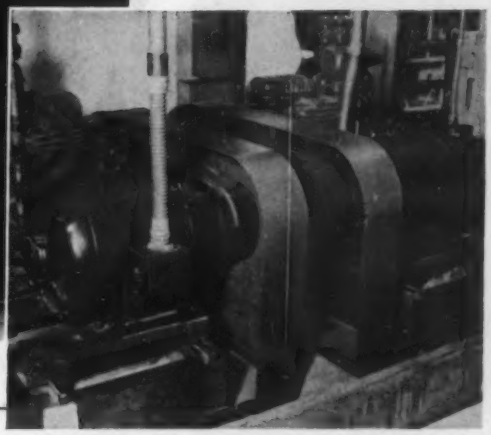
INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A-1.1



Four Century 5 horsepower splash proof motors driving fans.



Two Century 30 horsepower motors driving refrigeration compressors.

Century

TYPE SC-
SQUIRREL CAGE MOTORS

⅛ to ¾ horsepower

1 to 1½ horsepower

2 to 15 horsepower

20 to 125 horsepower

150 to 400 horsepower

Equipment Producers Select Century Motors

To Give You Long-Life Performance With Least Down-Time

The correct selection of the right combination of motor type, speed, power, torque, frame and mounting keeps Century motors on the job.

Team work between your motorized equipment producers and Century motor engineers means that you always get the right motor—selected from Century's wide range of types and kinds, in sizes from ⅛ to 400 horsepower for single or polyphase alternating current and direct current. You can be confident that you get top performance from the fine equipment these motors drive.

Skillful application makes sure that Century motors meet the exacting requirements of the machines they drive. That's your assurance of dependability.

CENTURY ELECTRIC CO. 1806 Pine St., St. Louis 3, Mo.
Offices and Stock Points in Principal Cities

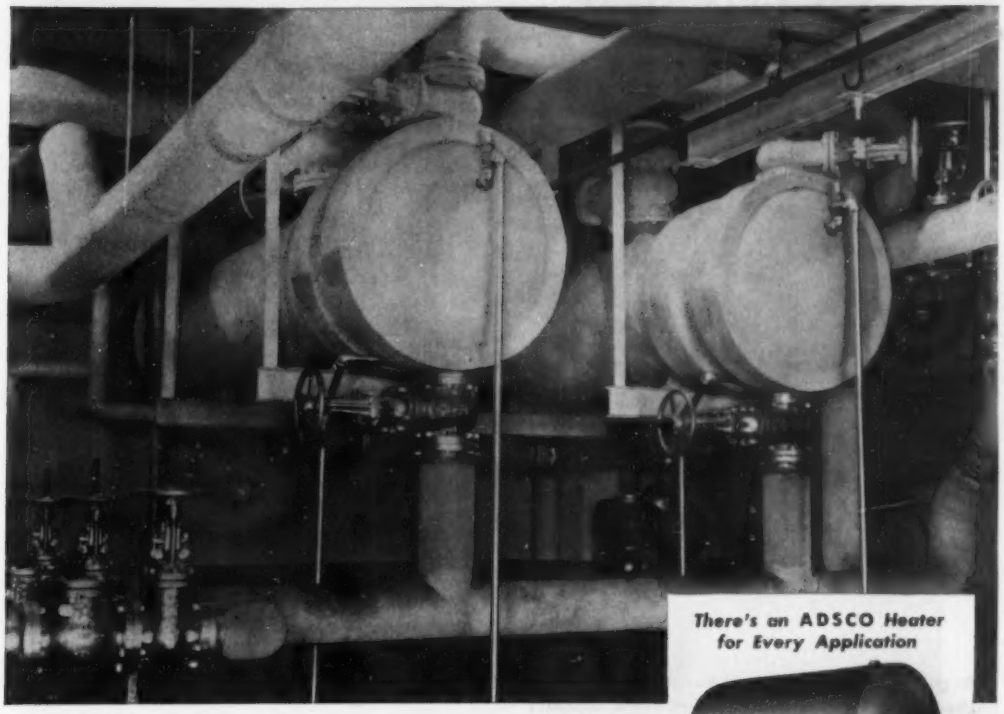
CE-6MR

Specify Century C MOTORS for all your electric power requirements

Wing

ADSCO HEAT EXCHANGERS...

"job-selected" for maximum efficiency!



● It's the job to be done that determines the selection of the proper heat exchanger. Few heat transfer problems are exactly alike and many require special engineering to achieve optimum results. Production is too important these days to permit inefficient operation and needless shut-downs. Insist on equipment built for the job and built to last.

ADSCO has always recognized the need for "tailoring" the equipment to the job. Its engineering department is constantly analyzing heat transfer problems and "job-selecting" the proper heat exchanger for the application. Every recommendation is backed by seventy years of experience in designing, manufacturing and installing steam equipment. Because ADSCO makes all types of heaters in a wide range of sizes, it can deliver the heat exchanger best suited for specific operating conditions.

Consult your ADSCO representative or submit your heating or cooling problem direct for a factory recommendation and quotation.

AMERICAN DISTRICT STEAM COMPANY, INC. ★ North Tonawanda, N. Y.

There's an ADSCO Heater for Every Application

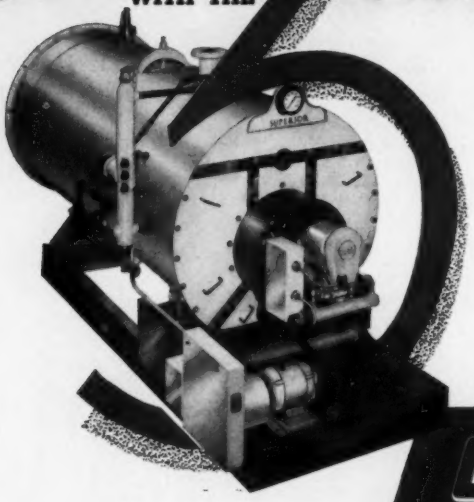
STORAGE HEATERS of welded construction in vertical and horizontal types. Removable U-tube element. Wide choice of materials. A. S. M. E. Code stamped when required.

INSTANTANEOUS WATER HEATERS are furnished as either steam tube or water tube types. Commonly used as instantaneous heaters, booster heaters, convertors, pool heaters or economizers.

FLOAT HEAD HEAT EXCHANGERS (Also shown in installation picture above) can be furnished with removable tube bundle and with split clamp ring construction for float head. Complete range of sizes to meet all specifications.

CAPACITY OPERATION Easily

WITH THE



Sq. Ft.

OF HEATING SURFACE PER B.H.P. IN EVERY

SUPERIOR STEAM GENERATOR

A good steam generator doesn't have to be pushed . . . it attains its maximum rated capacity with ease. Superior Steam Generators do just this and at thermal efficiencies in excess of 80% under field operating conditions. One of the main factors contributing to their full capacity operation at high efficiencies is the five square feet of heating surface per b.h.p. in every Superior Steam Generator.

High efficiencies developed on the job result in lower fuel costs. These same high efficiencies developed easily without pushing the steam generator result in lower maintenance costs and longer boiler life. The final result of course, is lower steam costs.

There are other features which contribute to the outstanding performance of Superior Steam Generators . . . multiple-fan induced down-draft which is built-in, combined with Superior 4-pass construction for higher efficiency . . . large evaporating surface for quick steaming . . . large steam space and dry pan to assure ample reserve steam capacity and 99.5% dry steam at the nozzle . . . and many other important features, each painstakingly developed through experience and research, to make a Superior Steam Generator the unit to cut your steam costs.

Superior Steam Generators are completely factory assembled, backed by undivided responsibility. Burn gas or oil, or both. Manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water.

Write today for the details in Catalog 304.

uperior ombustion ndustries, inc.

Factory Emmaus, Pa.
Executive Offices Times Tower, Times Square, New York 18, N. Y.

Men who know ducts INSIDE..

ULTRALITE DUCT LINER—ACOUSTICAL

This is the duct liner that **won't burn!**—a flexible, resilient, semi-rigid glass fiber insulation designed specifically as acoustical duct liner. Has excellent sound absorbing properties, particularly at the irritating noise levels. Won't break, flake or chip. Runs quickly around curves and corners. Friction loss is low. Won't delaminate under air movement; won't flake off in air stream.

ULTRALITE DUCT INSULATION and DUCT LINER

have every characteristic that makes application easy and quick. They're light, flexible, resilient; you can cut them with a knife; run them quickly around curves and corners; adhere them to metal with adhesives . . . screws and washers . . . wires! Get full details on Ultralite and learn why it goes on faster, easier and cheaper than any insulation you've ever used!

..and OUT..

ULTRALITE DUCT INSULATION — THERMAL

A soft, resilient, flexible insulation of long, fine glass fibers with a low K-factor. Available plain or with your choice of 4 vapor barrier facings, already adhered to the insulation. Wrap-around method of application cuts applied costs way down. Non-irritating, pleasant to handle. Fire-resistant, non-corrosive to metals.

...use ULTRALITE throughout!

WRITE TODAY for free samples and catalog A.I.A. File No. 37-D-2 or consult Sweet's File Architectural

GUSTIN-BACON ULTRALITE MANUFACTURING CO.

GUSTIN-BACON MFG. CO.

1412 WEST 12TH ST., KANSAS CITY, MO.

New York Chicago Philadelphia San Francisco Los Angeles Houston Tulsa Ft. Worth

Please send me samples of ULTRALITE and catalog A.I.A. File No. 37-D-2. HP-3

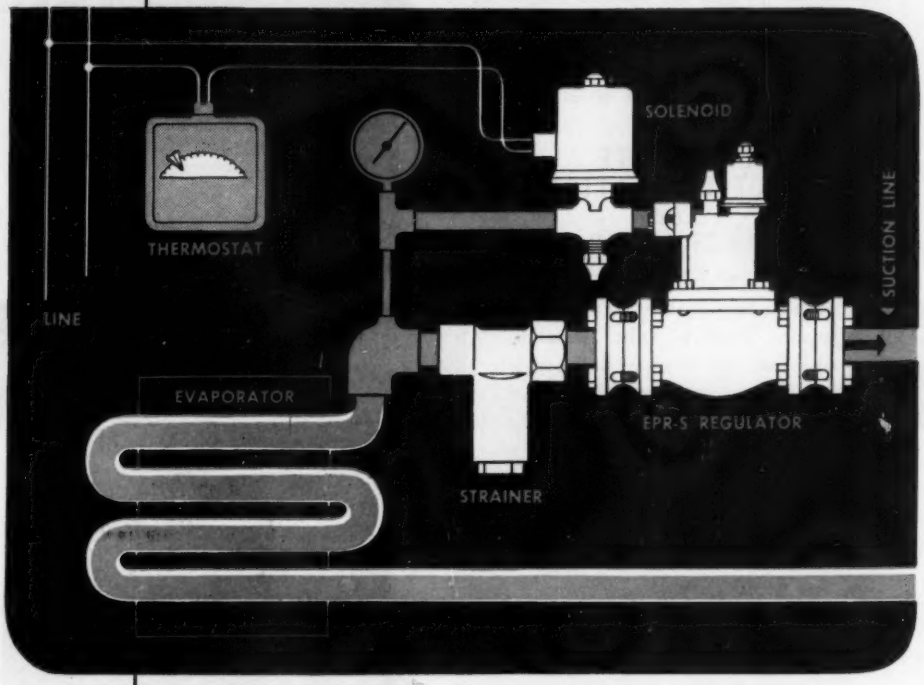
NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

ALCO SOLENOID-EPR COMBINATION for TEMPERATURE DIFFERENTIAL CONTROL



Try this performance-tested ALCO team—the EPR for accurate evaporator pressure regulation, *plus* the Solenoid for positive suction stop. Together, they solve the toughest close-control problems.

This ALCO Solenoid-EPR Combination is widely used on installations where pinpoint control is important: in the handling of plasma, biologicals, plastics and synthetics, and for food preservation on commercial and combatant ocean vessels throughout the world.

Try it on your next job where close control counts.

For further details, write for Bulletin 183.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

SEE YOUR ALCO WHOLESALER

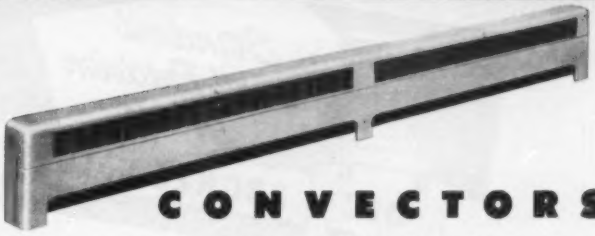
ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

4583

HOW TO ELIMINATE PICTURE WINDOW DRAFTS!

INSTALL YOUNG LOW-LEVEL CONVECTORS



Architects and heating contractors find the Young low-level convector-radiator line ideal for picture window installations. The streamlined, compact cabinets are just 12″ high—stand inconspicuously beneath the sill, or hide away in wall recesses. The generous selection of sizes range from 20″ to 112″ in length, and 4″, 6″, and 8″ in depth— meet any hot water or two-pipe steam system requirement.

What's more, you can rely upon Young ratings. These "FL" models, like the standard line, have been tested and rated in accordance with Commercial Standard CS 140-47, as developed cooperatively by the trade and national Bureau of Standards, U. S. Department of Commerce.

Young low-level models offer many distinctive design features to make specification and installation most satisfactory. The coupon, below, will rush you a copy of our new Catalog No. 4150 just off the press. You'll find it filled with helpful information.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality

Reg. U. S. Pat. Off.

Heating, Cooling, Air Conditioning Products in Home and Industry.

YOUNG RADIATOR COMPANY

Dept. 511-C, RACINE, WISCONSIN

Plants at Racine, Wisconsin and Mattoon, Illinois

Sales and Engineering Representatives in All Principal Cities

YOUNG RADIATOR COMPANY
Dept. 511-C
RACINE, WISCONSIN

I want to know more about your new low-level convector-radiators. Rush me my copy of Catalog No. 4150, without obligation.

NAME_____

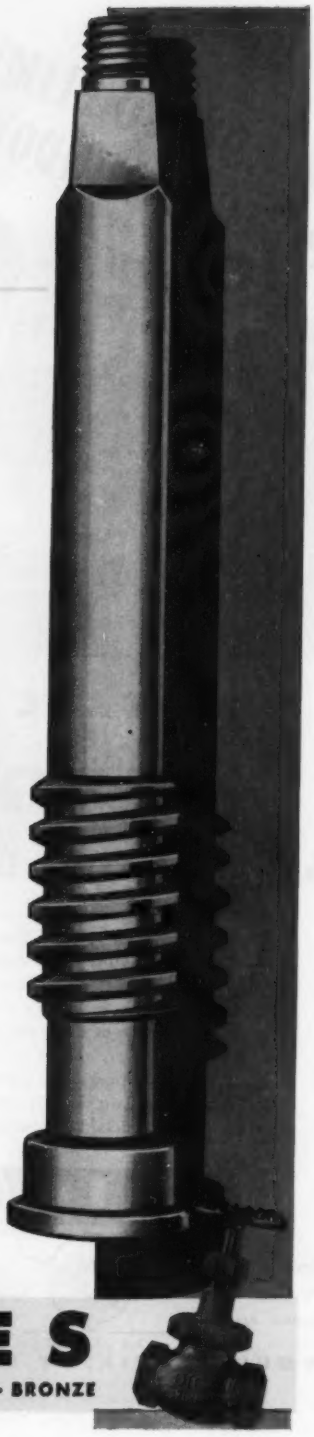
FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

THIS STEM WILL LAST LONGER

because it's machined from OIC Alloy 40



Months ago, we introduced Alloy 40 to the field; use has confirmed our laboratory tests. Now, we are ready to tell you about it.

Alloy 40 completely eliminates galling and seizing. It is harder and stronger. It is highly resistant to attack by corrosive liquids and semisolids. It lasts longer!

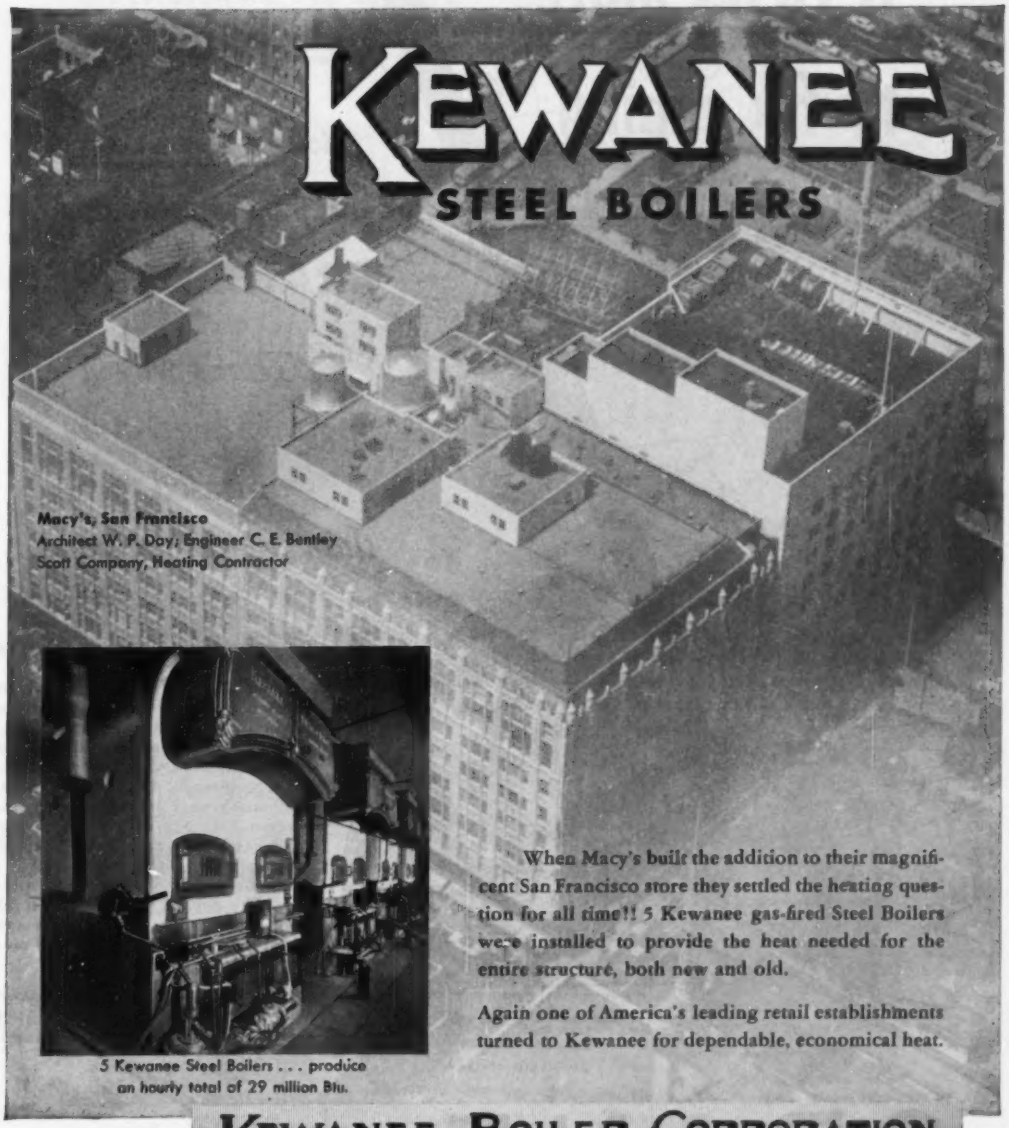
All OIC Bronze Valves are now equipped with Alloy 40 stems. The Ohio Injector Company, Wadsworth, Ohio.

OIC
FOUNDED 1883

VALVES

FORGED AND CAST STEEL · IRON · BRONZE

Macy's (SAN FRANCISCO) built an addition ...and switched to



Macy's, San Francisco
Architect W. P. Day; Engineer C. E. Bentley
Scott Company, Heating Contractor

5 Kewanee Steel Boilers . . . produce an hourly total of 29 million Btu.

When Macy's built the addition to their magnificent San Francisco store they settled the heating question for all time!! 5 Kewanee gas-fired Steel Boilers were installed to provide the heat needed for the entire structure, both new and old.

Again one of America's leading retail establishments turned to Kewanee for dependable, economical heat.

KEWANEE BOILER CORPORATION

BOILERMAKERS 80 YEARS KEWANEE, ILLINOIS

Branches in 60 Cities—Eastern District Offices: 40 West 40th Street, New York City 18

Division of American Radiator & Standard Sanitary Corporation

Serving home and industry

AMERICAN STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

It *costs more* to fix piping now!

No. 1615 Diaphragm Valve
Iron Body, Neoprene lined

You do less fixing

by using Dependable Quality

CRANE VALVES

. . . That's why more Crane Valves are used than any other make

better performing diaphragm valves

Separate disc and diaphragm design distinguishes these Crane Valves from all similar packless types. Life of diaphragm is multiplied because it's used only to seal the bonnet—not for seating. The separate disc seats the valve, eliminating wear and tear on the diaphragm.

Increased flow capacity . . . reduced flow resistance . . . tighter seating . . . lower torque and fewer turns to operate . . . are typical added features of Crane Diaphragm Valves. Wherever you use them, you can be sure of outstanding performance.

Such better quality and greater dependability mark Crane valves and fittings of every type—and assure the lowest ultimate cost.

CRANE

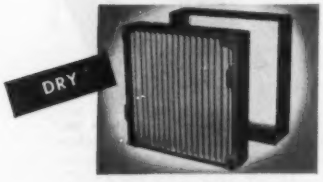
CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

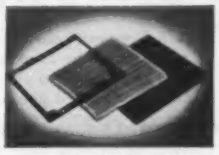
STAYNEW PANEL FILTERS AVAILABLE IN THESE MAJOR TYPES...

USERS ENDORSE BOTH FOR HEAVY DUTY VENTILATION SERVICE

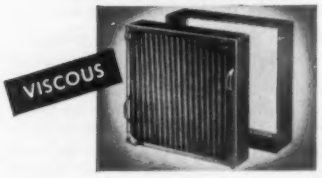
You can select a Staynew Filter—backed by 25 years of exclusive filter engineering experience—in either a DRY or a VISCOUS type. Both are heavily built, expertly designed units fulfilling the most exacting requirements of their respective applications. They provide outstanding performance in commercial and industrial installations. Full range of standard sizes in both types.



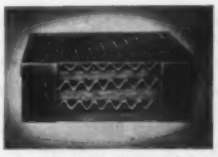
Filtering media to suit every requirement . . . easily cleaned . . . quick, inexpensive replacement of medium when required . . . greater filtering area . . . highly flame-resistant.



Dry Filter Cell Assembly



Large dust-holding capacity . . . medium arranged to provide "stage" filtration . . . unusually high dust removal efficiency . . . low resistance to air flow . . . unsurpassed cleaning ease.



Cross Section of Viscous Filter

COMPLETE DETAILS ON REQUEST

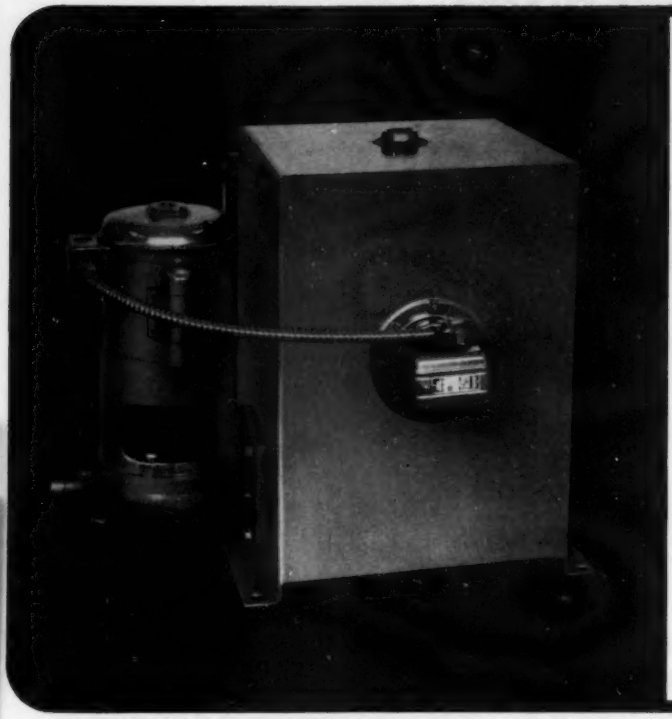
DOLLINGER CORPORATION

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

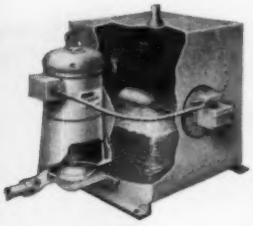
9 CENTRE PK., ROCHESTER 3, N. Y.

Representatives In Principal Cities

new dunham condensation pumps



other design features you'll want to know about



1. Completely Wired—ready for operation when piping connections are made.

2. Motors Mounted well above floor protect against surface water and floor cleaning operations.

3. Hydraulically Balanced enclosed type impeller; no close tolerances.

save space . . . save fuel
save on installation expense

Both you *and* your customer benefit when you install these new, more compact Dunham Condensate Pumps. You . . . because they're so easy to install. Your customer . . . because these efficient, long-lived pumps:

Save Space—Dunham pumps take surprisingly little floor space; are easy to handle, easy to warehouse. Also, they often increase usable heated space by permitting installation of radiation below boiler water level.

Save Fuel—Rapid return of hot condensate to boilers, rather than wasting it to sewers, saves makeup water . . . minimizes difficulties from boiler encrustation.

Save On Installation Expense—Two anchor bolts do entire job . . . no bars or bed plates necessary. Low level inlet connection permits gravity flow of condensate from return lines into receiver.

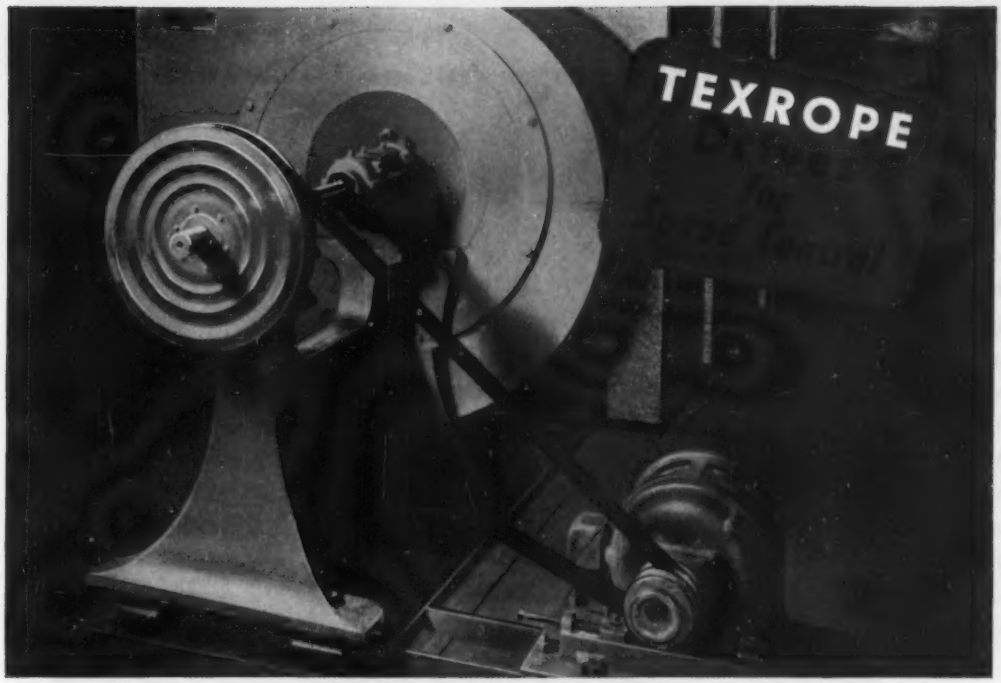
Send for new pump bulletin No. 1401-2. Contains complete information . . . including capacity tables, installation instructions, design details and typical specification sheets. Write today for your copy.

DUNHAM

C. A. DUNHAM COMPANY
400 W. Madison Street, Chicago 6, Illinois
In Canada: C. A. Dunham Co., Ltd., Toronto
In England: C. A. Dunham Co., Ltd., London

heating systems and equipment

Vari-Vac Differential Heating • Fin-Vector Radiation • Convector Radiation
Vacuum Pumps • Baseboard Radiation • Horizontal Heaters • Vertical Heaters • Cabinet Heaters • Traps • Valves



Change Fan Speeds This Fast, Low Cost Way

ALL THESE ADVANTAGES are yours with *Vari-Pitch* drives:

1 There's a wide range of types and sizes to fit operating conditions. Big or small, Stationary control or Motion control types are available.

2 *Texrope* drives are noiseless and tend to dampen vibration of other parts.

3 It takes only a few minutes to change the speed of a fan equipped with a *Vari-Pitch* Stationary Control drive. Takes even less time to balance and adjust system with Motion Control drives.

4 You get an infinite number of speeds from one sheave.

5 Speed of fan will not change once it has been set.

PLUS VALUES

One phone call brings you everything you need for your drive — motor, base, starter, sheaves and belts. In addition, you get the extra engineering help in field and factory that comes from Allis-Chalmers long experience. For A-C has more V-belt drive installations in industry than any other manufacturer.

Get one day, one call service on your next fan job by calling your nearest Allis-Chalmers Authorized Dealer or Sales Office, or write for bulletin 20B6082B, Allis-Chalmers, Milwaukee 1, Wisconsin.

A-3327

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sold . . .

Applied . .

Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Tri-Flex Aerovane..in the First National Bank of Tulsa

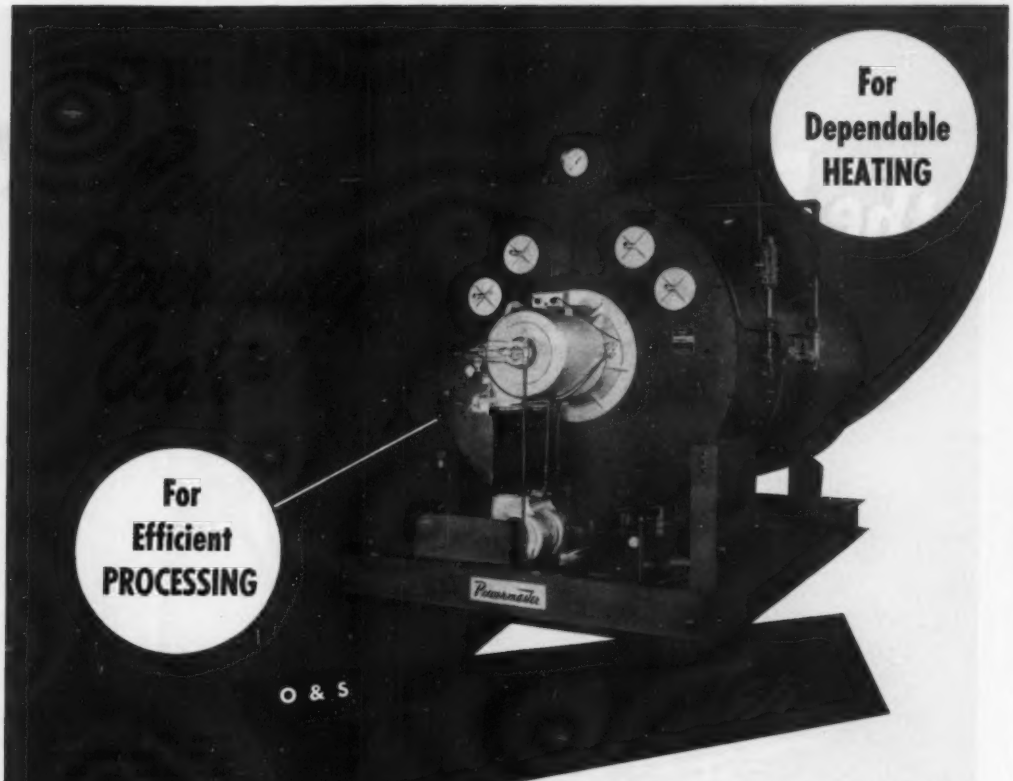
The selection of the distribution equipment for an air conditioning system depends on just two factors . . . performance . . . appearance. And two good reasons indeed why in Tulsa's beautiful new First National Bank Building there was no question about the choice of grilles and registers . . . Tri-Flex for supply . . . Aerovane for return. Unmatched in performance . . . maximum flexibility to meet the most rigid requirements of air delivery. Unmatched in appearance . . . styled to harmonize with whatever the interior design or decor may be. When you specify Tri-Flex and Aerovane, you can be sure of the results.

TUTTLE & BAILEY inc

Engineered Products for Air Conditioning, Heating and Ventilating

NEW BRITAIN, CONNECTICUT

4TB51



• With your operating costs growing higher than ever, isn't this a mighty good time to take a look at your boiler room? That's where efficient, cost-saving plant operation should start.

Maybe your boiler is eating fuel dollars. Perhaps it's inadequate to meet your greater steam demands. Chances are it's obsolete at today's standards. You may find it possible to cut costs enough to actually pay for a new O&S *Powermaster* unit in two or three years. Many *Powermaster* users tell us they *have!*

It makes sense to turn to this up-to-date self-contained unit to produce the steam or hot water you need. All Powermaster components are sized to coordinate most efficiently as a fully automatic packaged unit. You'll reduce operating costs (as much as 40%) and cut maintenance time to a minimum. You'll be sure of safe, smokefree, dependable operation.

Write today for complete information on a Powermaster unit for your specific needs. Or send coupon for latest bulletin describing all units.

Powermaster®

STEAM GENERATORS AND HOT WATER BOILER UNITS

Orr & Sembower, Inc.
990 Morgantown Rd., Reading, Pa.

Please mail latest catalog showing Powermaster's cost-cutting advantages.

Name_____

Company_____

Address_____

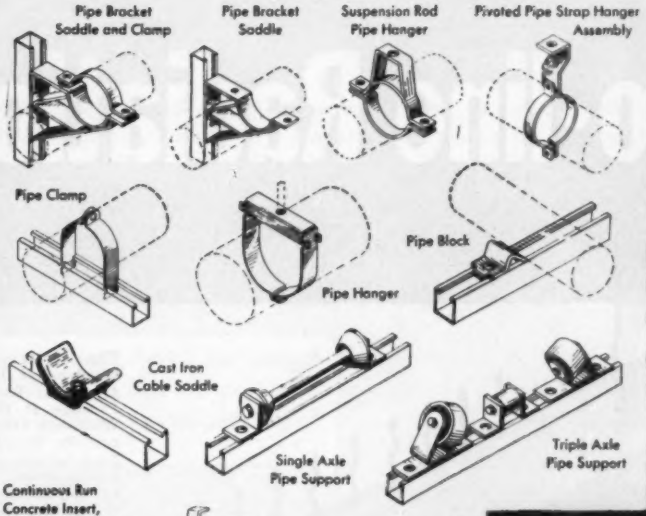
the 1,000,000th B&G BOOSTER

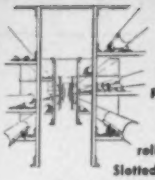
MAKERS OF
Hydro-Flo
PRODUCTS
Forced Hot Water Heating Systems . . . Centrifugal Pumps . . . Water Heaters . . . Heat Exchangers . . . Refrigeration Equipment.

BELL & GOSSETT *Company*
Dept. BY-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd.
1400 O'Connor Road, Toronto, Canada

UNISTRUT *Suspends, Supports, Frames Mechanical Piping* in one Great Flexible System!

● Unistrut is erected quickly, easily, with a minimum of engineering detailing—permits adjustments, changes or additions on the job or later—assures exact pitch or slope. No drilling, welding, special tools or equipment needed. Unistrut includes metal channel, framing fittings, concrete inserts, clamps, hangers and other standard parts which combine to form the world's most flexible system of support or suspension. Try Unistrut on your next piping job—save time, cut costs.

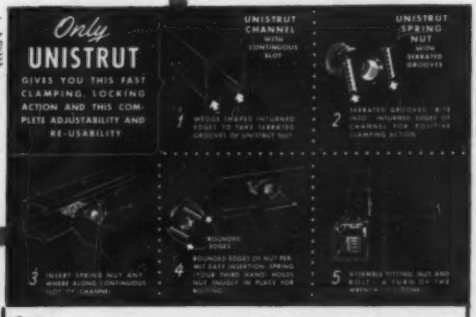

Pipe Bracket Saddle and Clamp
Pipe Bracket Saddle
Suspension Rod Pipe Hanger
Pivoted Pipe Strap Hanger Assembly
Pipe Clamp
Pipe Hanger
Pipe Block
Cast Iron Cable Saddle
Single Axle Pipe Support
Triple Axle Pipe Support
Continuous Run Concrete Insert, 3" to 20' lengths.
Note two kinds of end caps—at left, type A (plain) at right, type B (anchor).
Entrance Anywhere along this Continuous Slot!



Typical piping installation supported by Unistrut framework, concrete inserts and roller pipe supports. Slotted Unistrut channel permits attachment of fittings at any point desired.

Tunnel job showing how Unistrut continuous run concrete inserts may be installed vertically or horizontally or at any angle required. Attachments made anywhere along slotted channel without disturbing existing connections.

Here are Unistrut continuous run concrete inserts in ceiling, and Unistrut hangers clamped to suspended pipes. For racking heavy overhead pipe runs, Unistrut trapeze assemblies (not illustrated) are ideal.



Free Catalog and Wall Chart!

Representatives and Warehouse Stocks in Principal Cities—consult your Telephone Directories

U. S. Patent Numbers
2327587 2363382
2329815 2380379
2345630 2405631
Other patents pending

The World's Most Flexible All-Purpose Metal Framing

UNISTRUT PRODUCTS COMPANY
1013 W. WASHINGTON BLVD. • CHICAGO 7, ILLINOIS

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Chicago 7, Ill., Dept. H-3

Please send me 24 page Construction Catalog, 24" x 36" Wall Chart and sample of Unistrut as indicated below, without obligation.

☐ Catalog No. 500 ☐ Wall Chart ☐ Unistrut Sample

Name_____

Company_____

Address_____

City_____ Zone____ State_____

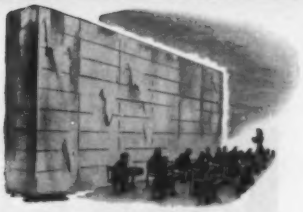
gives you

Wind·o·line Radiation

The illustrations show Wind·o·line installed as a part of The Nesbitt Package at the Thomas Williams School, Wyncote, Pa. The enlarged section below shows the grilled Wind·o·line channel and finned-tube radiation which extend from both sides of the Syncretizer unit ventilator for the full length of the window area.

An Extra Thermal Blanket WHERE NEEDED

Answers the "WALL-OF-ICE" Problem

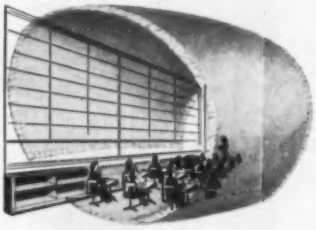


In sub-freezing weather, window areas become like a "wall-of-ice".

THE trend toward larger areas of fenestration in the modern schoolroom makes greater demands of the heating and ventilating unit. The "thermal blanket" provided by the Nesbitt Syncretizer adequately shields occupants against the window "wall-of-ice" in normal situations; but under conditions of extremely long glass exposure and very low outdoor temperatures, an "extra blanket" is called for. Nesbitt WIND·O·LINE meets such needs.

When specified as an auxiliary of the free-standing Nesbitt Syncretizer, WIND·O·LINE consists of finned-tube radiation in an attractive grilled casing. It is located just below the windows and extends from both ends of the Syncretizer unit ventilator, for the full length of the sill. It is controlled in cycle with the Syncretizer to give heat—when required—where heat is needed.

WIND·O·LINE is also available (as pictured below) as a component of The Nesbitt Package, recessed in a channel at the rear of the storage units. WIND·O·LINE is yet another Nesbitt innovation which permits more of America's schools to enjoy the *new standard of classroom comfort.*



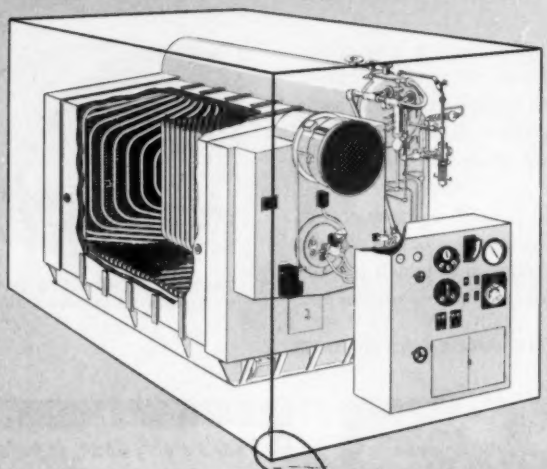
The Nesbitt Thermal Blanket protects occupants from cold windows.

MADE AND SOLD BY JOHN J. NESBITT, INC. PHILADELPHIA 36, PA., SOLD ALSO BY AMERICAN BLOWER CORPORATION

—You mean there's just enough heat here to take the chill off the windows on real cold days?
That's right, Joan, it puts an 'extra' blanket of heat between us and the cold 'wall of ice'.

get your steam

3,500 to 25,000 lb per hr



B&W Integral-Furnace Boiler, Type FM

• in this
• NEW
• shop-
• assembled
• unit

note these **cost-saving** features

- Saves Erection Time and Cost
- Meets Wide Range of Services
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Send for Bulletin G-72, detailing the many advantages of this new B&W creation in low-cost steam generation. The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

Helping Industry Cut Steam Costs Since 1867

BABCOCK & WILCOX

G-536

THE EDITOR'S PAGES

• IT WAS A GREAT pleasure to see many old friends — and to make some new ones — at the International Heating, Ventilating & Air Conditioning Exposition held in Philadelphia the end of January. At HPAC's booth, near the main entrance, reprints of the Show Section originally published in the January issue were in considerable demand, as this editorial feature comprised a complete guide to the hundreds of exhibits. Many readers took the trouble to bring their copies of the January HPAC to Philadelphia, and before the next exposition we'll try to remind you that reprints of the Show Section will be available at our booth . . . . This exposition — which has grown so large with the development of the heating, ventilating and air conditioning industry that there aren't too many cities that can now accommodate it — goes back to the two-year cycle, as has been planned for some time, and is scheduled for Chicago in January 1953 in conjunction (per custom) with the annual meeting of the American Society of Heating and Ventilating Engineers. The ASHVE's 1952 annual meeting — no exposition — is to be held in St. Louis next January.

REVIEWS AVAILABILITY OF REFRIGERATION EQUIPMENT

THE REFRIGERATION industry is in reasonably good shape at the moment with respect to maintenance and repair parts for existing equipment — possible exceptions being copper and steel pipe and motors — Fred W. Smith, President of Baker Refrigeration Corp., told members of the National Association of Refrigerated Warehouses in an address at Boston early last month. Unless some sort of priority relief is set up by the government in the very near future for maintenance and repair items, however, this situation could change very quickly, he said. It is believed quite probable that some such priority assistance order will be issued in the not too distant future, he stated.

With respect to new equipment for expansion, alterations and replacement, Mr. Smith believes it is reasonable to say that the industry in general has a backlog of orders ranging from three to five months depending on the size or type of product. The cause for this period of backlog is not because of inability to produce more compressors, condensers and other accessories, but because of the ever lengthening lead time on raw materials and components, he stated. True, sales have increased in the past six months because many people have been anticipating future needs but the industry could still keep up with this increase if materials and components were readily available. This situation will get much worse before it gets better, in his opinion.

The future picture depends very largely upon what the $3¼ billion refrigeration industry can do to "sell" the essentiality of refrigeration equipment to various government agencies and what the refrigeration consumer industries can do to convince government agencies that refrigeration equipment is essential to them, he pointed out.

MECHANICAL CONTRACTORS FORM JOINT COMMITTEE

THE NATIONAL associations of the heating, piping, air conditioning, electrical and plumbing contracting industries announced last month formation of a Liaison Committee of the Mechanical Specialty Contracting Industries for the furtherance of the national defense program.

Purpose is to cooperate with the armed services and other branches of the government, the building construction industry and Congress in all phases of the national defense effort. The committee represents the common interests of approximately 35,000 mechanical specialty contractors whose work involves approximately 50 percent of the dollar value of modern buildings.

The liaison committee is composed of top executives of the three trade associations in the mechanical specialty contracting industries — the National Association of Master Plumbers, the National Electrical Contractors Association, and the Heating, Piping and Air Conditioning Contractors National Association.

Announcing the formation of the joint group, the committee said that the mechanical specialty contracting industries have on their own initiative expanded their capacity to produce by three or four times during and since World War II.

Four suggestions for furthering the defense program were made by the committee:

"1) That full use be made of existing mechanical specialty contractor organizations having tools, equipment, technical and supervisory staffs who are now prepared to do the job, instead of allowing them to stand idle while inexperienced and inefficient high cost organizations are developed.

"2) That job management functions and experience-tested industry practices be given full play and encouraged rather than suppressed or supplanted by arbitrary and unrealistic policies or procedures.

"3) That mechanical specialty contractors be assigned complete responsibility for the procurement of all equipment, material and labor required to accomplish their part of the project.

"4) That normal contracting procedures be followed to permit the awarding of the mechanical specialty work to established organizations of experience and proved capabilities."

CLIMATIC ATLAS OF U. S. IS COMMITTEE'S OBJECTIVE

A "CLIMATIC ATLAS" of the United States should be the ultimate objective of the work of the subcommittee on climatic research of the National Research Council's Building Research Advisory Board, says Thomas H. Urdahl, consulting engineer and chairman of this recently appointed subcommittee. However, the immediate activities of the group will probably be directed toward explaining to design engineers, architects and others the use of climatological data, and the importance of correct analysis of weather data to the design of buildings and their heating, ventilating and air conditioning services.

The construction industry — and heating, ventilating and air condi-

PROVES STRENGTH OF WELDS

A WELD IS as strong or stronger than the plate in which it is made, says The Lincoln Electric Co., cites this Acme photo as proof. When a mile of 30 in. pipe line exploded, the welds, both longitudinal and circumferential, held while the plate tore apart. The solid welds can be seen in the section of pipe in the top of the picture.

tioning people in particular — have distinct need for more accurate climatic data than now available, according to Mr. Urdahl. Principal obstacle to the compilation of such data has not been any lack of interest, but rather the time and money necessary to analyze and tabulate a thoroughly qualitative and quantitative study of the weather for each locality.

It is felt that the subcommittee well represents the various interests involved. Its membership comprises, in addition to the chairman, Miles L. Colean, Housing Economist; Dr. H. E. Landsberg, Executive Director, Committee on Geophysics and Geography, Research and Development Board, Department of Defense; Comdr. F. W. Reichelderfer, USN (Ret), Chief, U. S. Weather Bureau; J. R. Schreiner, Director of Research, Air Conditioning and Refrigerating Machinery Association; Dr. Paul A. Siple, Military Geographer, The General Staff, U. S. Army; A. C. Shire, Chief, Technology Branch, Housing & Home Finance Agency; Mason C. Prichard, U. S. Army Engineers; W. A. Taylor, Director, Dept of Education and Research, American Institute of Architects; Comdr. John Koleszar, CEC, USN, Bureau of Yards and Docks, Department of the Navy; Eugene W. Goodwin, Chief, Mechanical Section, Public Buildings Service, General Services Administration.

SEES BIG MARKET FOR ROOM CONDITIONERS

POPULARITY OF room air conditioners has developed so rapidly during the last two years that manufacturers could not possibly meet the demand in 1951 even if all necessary materials were easily available, according to Salvatore Giordano, president of Fedders-Quigan Corp.

Predicting a total output this year of about 200,000 units — approximately the same number of room air conditioners as were manufactured by the entire industry in 1950 — he indicated that there is an immediate market for almost 600,000 units.

"If there were no restrictions on materials, I doubt if the combined industry has the required facilities to build more than 400,000 room air conditioners within the next 12 months," he said.

ANNUAL REPORT SHOWS NEW HIGHS

CARRIER CORP., manufacturer of air conditioning, refrigeration and industrial heating equipment, has reported a net profit of $3,164,450, for the fiscal year ended October 31, 1950. This compares with $1,834,967 in fiscal 1949. In its annual report, the corporation revealed completed sales of $62,390,539 as compared with $46,209,169 during the preceding 12 months. New orders booked totalled $67,290,088 as against $44,479,196 in fiscal 1949.

The backlog of unfilled orders totalled $26,773,857 on October 31, 1950, an increase of $11,096,817 over the amount of unfinished business a year earlier.

Cloud Wampler, president, stated that during the first 12 weeks of fiscal 1951 approximately $27 million of new business had been booked. This includes some $5 million of defense orders. In addition, the corporation has commitments covering more than $20 million of special government work.

Mr. Wampler also pointed out that the backlog of the corporation now totals roughly $33 million, exclusive of the above-mentioned $25 million of defense business.

RECOMMENDATIONS FOR USE OF COPPER TUBE

FOR MANY YEARS, specification No. B 88 of the American Society for Testing Materials, on seamless copper water tubes, has covered the three types of tubes generally used, but there has been some confusion on which types should be used for underground service, for interior applications, or with soldered fittings.

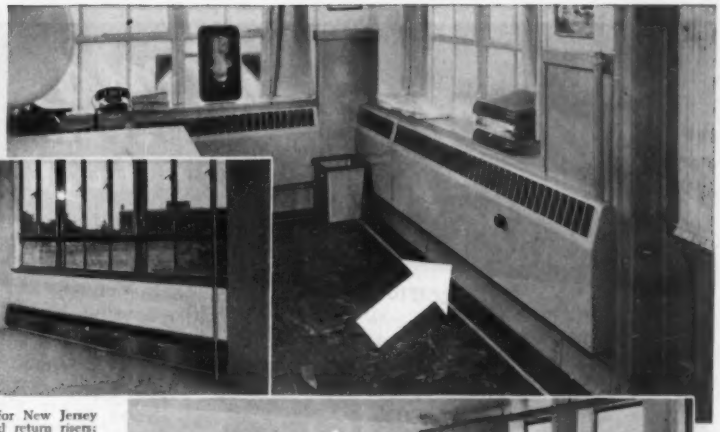
ASTM committee B-5 has added recommendations to the specifications clarifying the application of the three types. The latest recommendations are: type K for underground services and general plumbing and heating purposes involving severe service conditions; type L for general plumbing and heating; and type M in sizes 2½ in. and larger, with soldered fittings only, for general plumbing and heating purposes. Sizes 1¼, 1½, and 2 in. in type M are recommended solely for soil, waste and vent lines, and other interior nonpressure uses.

"QUOTE"

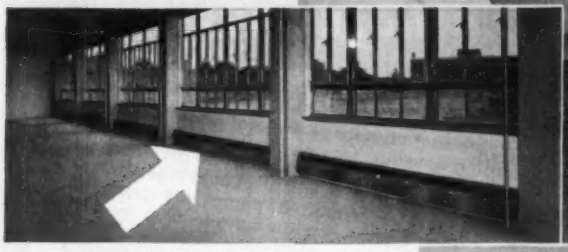
"In April 1924 a famous lecturer — a prominent and powerful world figure, whose name incidentally and interestingly enough was Steel — in a lecture at a foreign university paid this great compliment to American efficiency:

'American efficiency is that indomitable spirit that neither knows nor will be deterred by any obstacle, that plugs away with businesslike perseverance until every impediment has been removed, that simply must go through with a job once it has been tackled. . .'

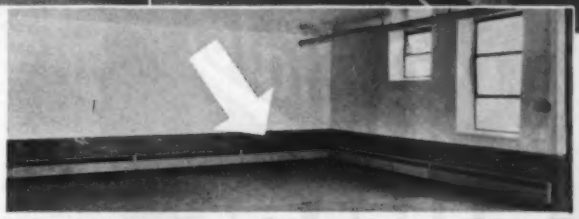
"On the chance that some of you may not recognize this personality, I may say that he is better known to you by his Russian name for steel — Stalin. That, 26 years ago, was Josef Stalin's ungrudging and complimentary appraisal of America. I feel certain that he thinks no less respectfully of the genius of American business today." — *from an address on steel by Secretary of Commerce Charles Sawyer, in Pittsburgh last month.*



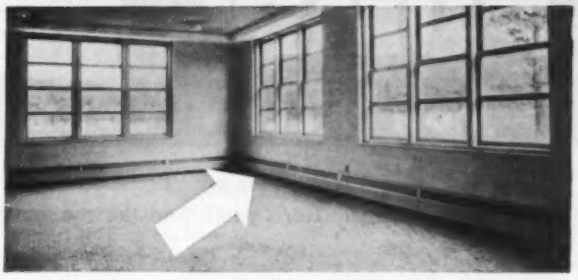
Webster Walvector in office of Mulholland-Harper Company, Philadelphia. Installation by contractor Herbert Baker & Co.



Webster Walvector in new office building for New Jersey State Highway Department. Note supply and return risers; location of Walvector trim piece connectors immediately below window mullions, facilitating installation of office partitions. A Webster Moderator Steam Heating installation, Micklewright & Mountford, Architects, Runyon & Carey, Consulting Engineers, Philip S. Slack & Company, Heating Contractors.



Unheated basement room made available for parochial school classroom use. Webster Walvector in St. Robert's School, Chester, Pa. heats added room with hot water through heat exchanger, without change in main steam heating plant. Modernization installation by heating contractor John A. Morgan, Chester.



Walvector in Norfolk, Va., Catholic High School Lunchroom. Gleeson & Mulrooney, Architects, T. David Fitz-Gibbon, Associate Architect, M. G. Flurer, Consulting Engineer, Coley & Petersen, Heating Contractors.

SOLVES DESIGN PROBLEMS

Webster Walvector, the new idea in wall radiation, is daily solving engineers' heating design problems in new buildings and in modernization.

Illustrated here are four typical installations—an outstanding reinforced concrete structure for the N. J. State Highway Department; an interior of one of the most impressive, large, new Catholic high schools; a modernization of an industrial plant office; a conversion of a school basement into a useful classroom.

Here are some of the reasons why Webster Walvector solves design problems:

Walvector spreads the heat the full length of the wall, does away with hot spots, provides the really-wanted mild heating.

Walvector is out of the way, fits in splendidly in single story or multi-story buildings.

Walvector provides space for concealing much piping exposed with older types of radiation.

Walvector serves as readily with forced hot water as with steam . . . with forced hot water it can be used in "series connection" on perimeter heating principles developed by Webster.

Walvector lessens installation labor on steam jobs . . . with wall to wall installation long and complicated runouts are eliminated.

Walvector has high output, low weight.

Walvector assures clean heating, has ample sponge rubber gasket seal between mounting angle and wall.

Write for Bulletin B-1551 for complete dimensions, ratings, specifications, technical data.

Address Dept. HP-3

WARREN WEBSTER & COMPANY, Camden 5, N. J.

Reps. in Principal Cities • *In Canada, Darling Bros., Ltd., Montreal*

Webster WALVECTOR

For Steam and Hot Water Heating

Specifications SPEAK LOUDER THAN ADJECTIVES

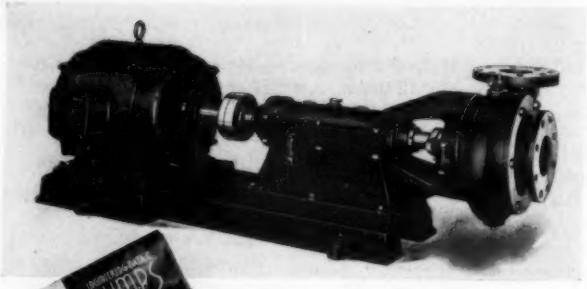
SPECIFICATIONS — BUFFALO FULL BEARING PUMPS

Casing: Solid shell volute type with removable suction side plate. Male and female fit insures perfect alignment of casing with supporting housing. Casing can be revolved before or after leaving the factory to give at least four different positions of openings. Unless otherwise requested, pumps are arranged with vertical up discharge. Can be furnished either rotation. **Wearing Rings:** Easily renewable wearing rings, protect casing from wear. **Impeller:** High efficiency enclosed type with liberal openings to pass abrasive solids. Enclosed impeller construction eliminates wear on the pump casing. Impeller mounted on shaft by feather key and lock nut and screw. Open impeller can be furnished where necessary, in which case wearing rings are omitted. **Bearing Housing:** Supporting head and bearing housing cast integral and bored at same operation insuring perma[illegible]

in "Buffalo" PUMPS

FOR ALLOY CONSTRUCTION

● **A look at the specifications tells of the fine quality construction of Buffalo Pumps. Here you'll find the reasons for their easy maintenance and their suitability for long service.**



"Buffalo" Full Ball Bearing Pumps are available in a wide variety of alloys. For lowest cost in pumping your special liquids, write for BULLETIN 982 and let the specifications tell the story.

"Buffalo" PUMPS

BUFFALO PUMPS INC.

171 MORTIMER ST. BUFFALO, NEW YORK

Canada Pumps, Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

• DO YOU HAVE something you'd like to say about any of the articles published this month? An additional comment, or perhaps a question on some point? Or do you want to express your views on some other matter of interest to heating, piping and air conditioning engineers or contractors? We follow here each month the practice at engineering society meetings of providing an "open for discussion" period. You are invited to participate. Address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

WHAT'S PROVED BY "REFLECTION POINT"?

I READ WITH considerable interest the article on Radiant Conditioning in Use at "Reflection Point", by Dr. Clarence A. Mills, in the December HPAC.

However, there are several phases of this article which I believe need clarification, in order for the scheme described in it to receive general acceptance, as the end result seems at considerable variance with good recommended practice for comfort cooling.

Early in the paper, the author says that experiments have indicated that man's initiative and physical vitality are in large measure dominated by the ease with which he can get rid of body waste heat, and that a retarding of that process tends to cause him to slump into a "vegetative existence."

A bit further on it is stated that a fair condition of comfort was achieved with 89 F dry bulb and a wet bulb the same as outside — the outside conditions being 96 F dry bulb and 78 percent relative humidity. This would mean 89 F dry bulb at 100 percent relative humidity inside, as 96 F dry bulb and 78 percent relative humidity indicates slightly over 89 F wet bulb.

Unless there is some special quality to this air "other than stale smoke, dirt and general contaminant removal" by the electrostatic precipitator inserted in the air stream, I fail to understand how such a condition could produce any feeling of vitality.

I fail completely to understand how such a condition could produce any feeling of vitality. In fact, such a condition could be considered quite uncomfortable — even for sedentary activity — for with 100 percent saturation there is no room for latent heat removal by evaporation from the body surfaces, a most salient feature in comfort cooling.

Complete saturation would tend toward discomfort at any temperature range in the accepted comfort zone, while in this case the situation would be aggravated by the close approach to body temperature.

The author further mentions that no air spillage has been observed from the region of the evaporator tubes around the periphery of the room near the ceiling. This statement would indicate good circulation of air in that region, as the evaporator surfaces can obtain heat only from the air surrounding them and by reflective radiation from the immediate adjacent surfaces of the trough, side wall and ceiling.

The spillage may not be observable, but it must be around somewhere in order to bring the temperature down 7 deg below outside design.

I should like to discuss the structure of and method of installation of the reflective foil used in this application.

Information absorbed up to this point, relative to such methods, and including papers by the manufacturer of the foil indicate $\frac{3}{8}$ in. and preferably $\frac{3}{4}$ in. air space facing the emitting side of the reflecting surface.

I assume all reflective foil used in this case is fastened directly on the inside of sidewalls and ceilings, which would seem to be ideal for the heating season, but how efficient would it be during cooling?

As a result of some quick calculation, a doubt comes to mind whether the structure in question has any substantial superior qualities from a cooling standpoint, over and above the ordinary.

The reason I question this is because in a number of cases I have had occasion to cool structures of the approximate size and assumed floor area that seem to represent "Reflection Point."

These jobs were done effectively using compressors and equipment not exceeding 3 hp and provided acceptable comfort conditions — 75 to 80 F dry bulb with wet bulbs well below the 60 F mark — with outside design conditions equally severe as those encountered by Dr. Mills.

In running a heat gain calculation on an ordinary frame structure uninsulated, of similar size and design, it becomes quite obvious that to achieve results comparable to those stated for "Reflection Point," a load of less than 2 tons is indicated and this not taking into account the concrete floor slab, and assuming summer ground temperatures of 70 F we have 19 deg difference to play with.

The amount of heat passed to the ground through the slab would be indefinite due to the three layer covering of foil, rubber foam waffle, and nylon carpet. On the other hand, one can be sure of some transfer, thus lowering the tonnage requirement.

Briefly, the results achieved seem to prove nothing beyond a 7 deg sensible heat drop from outside design, with little or no latent heat removal whatever, and would indicate (in my opinion) by ordinary good practice to be a waste of time, money and equipment, with the exception of the electrostatic precipitator and air handling equipment.—L. E. BAILEY, Sales Engineer.

AUTHOR'S REPLY — It is obvious from Mr. Bailey's comments that he is thinking in terms of air transfer of kinetic heat to and from the body. With "reflective radiant conditioning," we attempt to minimize

such transfer and promote heat flow to and from the body through radiant channels. Mr. Bailey fails—in my opinion—to appreciate that an individual can be cooled adequately—can, indeed, be over-cooled—while the surrounding air remains above 95 F and 80 percent relative humidity, as was conclusively demonstrated in our laboratory studies published in the ASHVE Journal Section in the November 1937 issue of Heating, Piping & Air Conditioning.

The set-up at Reflection Point represents an attempt to adapt reflective radiant conditioning to actual field conditions. Admittedly, the application is not yet perfected in this first installation. In my article, it was specifically stated that "accurate cooling studies must await another summer's heat —".

There was an unfortunate error in my reference to the 96 F day of last summer—the 78 percent relative humidity was indoors (not outdoors) and wet bulb readings were practically the same inside and out.

I extend a cordial invitation to Mr. Bailey to visit Reflection Point during next summer's heat, to see for himself that there is no spillage of cold air from the trough down into the room—nor other active air currents into the trough. The 7 deg of air cooling mentioned for the 96 F day took place largely from rugs and furniture fabrics which had lost radiant heat to the cove cooling coils and thus had become several degrees cooler than the contiguous air. When the radiant heat flow is reversed in winter heating, the rugs and furniture fabrics maintain a temperature about 14 F *above* that of contiguous air because of radiant heat absorption. Air heating in winter or air cooling in summer is thus largely achieved through contact with these radiant heat absorbing or radiant heat emitting materials which constitute the room's lower exposure.

For Mr. Bailey's information, I might mention that calculation of the structure's heat gain has been made for me by Mr. Keune of the Cincinnati Gas and Electric Co., using regular ASHVE factors and methods, and was found to total 87,726 Btu per hr. This is equivalent to 7.3 tons of refrigeration, and Mr. Bailey would perform a miracle of air conditioning if he could do it with "less than 2 tons", as he states in his remarks.

As a matter of general information, I might add that Reflection Point has been made comfortable this winter with but slightly over half the heat input that would have been required by conventional heating methods for maintaining 72 F indoor temperature under the weather conditions that prevailed. Comfort has been achieved at mean daily temperatures as low as 61 F, although the winter's average daily mean indoors has been 68 F. Indoor air temperatures below 60 F are not well tolerated while the individual is in motion, although one might be comfortable quietly seated.

Other factual findings at Reflection Point will be published as they accumulate.—CLARENCE A. MILLS, Ph.D., M.D., Professor of Experimental Medicine, University of Cincinnati.

REGULATING WATER USE FOR AIR CONDITIONING

IN SECTION 5, Permit to Install, of the "model ordinance" for regulating the installation and operation of air conditioning and refrigerating equipment developed by the American Water Works Association and published in the January HPAC, it is stated that permits are to be issued only in the names of licensed and bonded plumbers. In no part of the ordinance can I find any mention of or reference to the engineer who designs the installation.

Since there are many more important considerations in these installations, I can't understand the stress on having a licensed plumber be the eligible party to receive the permit. There are mechanical, electrical, chemical and safety problems which are just as important as piping connections to water and sewer lines.

I suggest that the terminology be re-considered and the code rewritten to require the submission of plans prepared by a registered engineer, who will also make application for the permit to install. The permit should be made out in the owner's name and not the plumber's name. —JOHN R. QUINZIO, Licensed Professional Engineer.

L. L. LEWIS' COMMENTS in the February issue on the AWWA model ordinance for regulating use of water, published in the January HPAC, reflect the opinions of many people, in that air conditioning cooling water requirements are generally considered as being responsible for present-day peak load water distribution difficulties. This is not true in many cities, and the air conditioning industry should not be the "whipping boy."

The main reasons for water shortages are over-population, doubled use in the past 10 years by domestic users, increased use by industry (especially chemical processes), irrigation, and many others related to the modern American way of life.

The fact that water is one of our cheapest utilities, costing less than 5c per ton, makes it susceptible to waste on the part of the casual user. It is such things as these that Mr. Lewis implies in his remarks, and that should be considered in the overall problem of water conservation and restrictive measures.—HOWARD E. DEGLER, Technical Director, The Marley Co., Inc.

MAKE THESE CHANGES IN DIRECTORY SECTION

IN THE DIRECTORY SECTION published in the January HPAC—the yellow pages—a transposed line on page 80d shows the Iron City Chemical Co. under the heading Units, Fuel Oil, Heating, Pumping and Straining instead of under the heading Units, Sterilizing, Air, where it properly belongs.

Also, through a clerical error, The Titusville Iron Works Co. was not dotted under the headings for fire tube and water tube steel boilers, and packaged steam generating units, on pages 7d and 8d of the directory. Dots should have been shown because of the Titusville advertisement on page 286 of the January issue.

These errors are regretted. HPAC's staff will appreciate being advised of any other errors that are noticed in the Directory Section, so that they may be corrected.

* * * * *

HPAC's editors are always on the lookout for article ideas and suggestions for subjects to be treated in our pages. If you have a possible article in mind, you are cordially invited to drop us a line.

In these times of scarcities it is more than ever important to remember that two or more heads are better than one. Your suppliers, for example, know a great deal about the materials they handle, how to select, specify and install them.

No matter what you buy it will pay you to draw upon this knowledge. It may help you make scarce materials go further, reduce costs of installation, perhaps even suggest a substitute.

AND of course for close collaboration regarding permitted uses of such Revere Building Products as Revere Copper Water Tube, Revere Copper Pipe, Revere Red Brass Pipe, get in touch with the Revere Technical Advisory Service through the Revere Distributor nearest you.

REVERE 150th YEAR OF SERVICE TO AMERICA

COPPER AND BRASS INCORPORATED

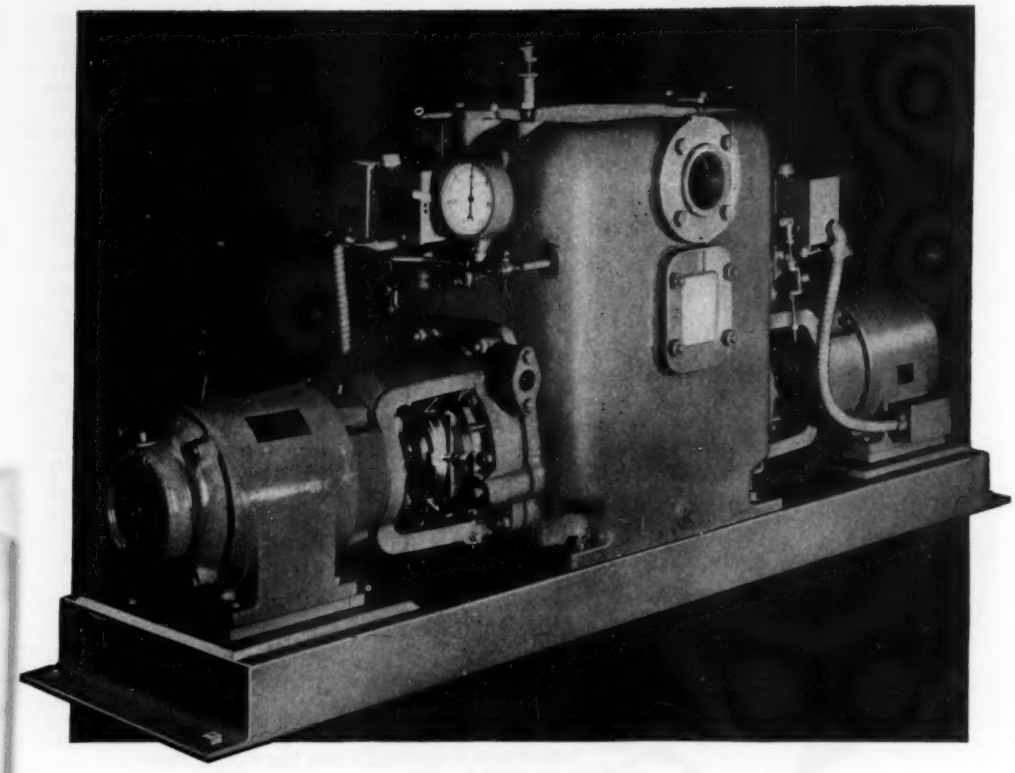
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



THE HEATING PUMP WITH CERTIFIED PERFORMANCE

A Jennings Return Line Vacuum Heating Pump may be installed with the absolute assurance that it is of the proper capacity to keep your heating system at top-notch efficiency.

For the actual working capacity of your Jennings Pump is determined by careful tests under working conditions, and with the actual motor that goes on your job, regardless of current characteristics. Every Jennings Pump has to deliver full rated capacity of air and water simultaneously before it is released.

The Jennings Heating Pump has everything in the way of safety, convenience, and real dollar saving economy that years of experience as leading heating pump manufacturers have enabled us to put into it. Quality is backed by an unchallenged reputation, and satisfactory performance is assured by a nation-wide network of Sales and Service offices.

THE NASH ENGINEERING COMPANY

Piping System Maintenance at Western Electric Plant

By A. H. Gipson and D. C. Gerloff
Western Electric Co.

The use of proved, modern equipment and standardized layouts with provisions for alteration and expansion are as important on small, simple plant piping systems as on large, complex ones, but the point is best demonstrated by examples such as the big Allentown plant of Western Electric. Experience with the 13 piping services and their maintenance and operation is detailed here

THE UNUSUAL PIPING system installed by the Western Electric Co. in its new controlled conditions plant at Allentown, Pa., was described in the August 1949 issue of HPAC. Since that time, the company has had a full cycle of operating experience with both material and personnel, which has resulted in some interesting observations.

There is little doubt that the selection of the system has resulted in appreciably lower maintenance costs. This has been due to no great development of materials but rather to a very careful selection of standard materials designed into a system that uses each to its best advantage and foresees the possible necessity of making a connection from any of the 13 pipe services to a machine placed anywhere on the plant's two 375 by 450 ft floors.

Factory Piping Standards Simplify Engineering

The selection of materials and their use is formalized in a set of instructions known as Factory Piping Standards. These standards were first used as a series of instructions for the engineers who designed the initial installation. They were next used as a reference in the proper installation of the miles of piping in the plant's service grid. They have now become the "bible" for moves, rearrangements and repairs, and as such assure that the original intent of the piping system is maintained.

The most valuable use of the standards has proved to be in reducing engineering time, for it is only necessary to spot a machine on the floor and pipe to it according to the standards. The standards, however, are not static. As with any vital operating tool, they are amended and changed as improvements are made. In this way, the necessity for each engineer to make his own initial crop of discoveries and mistakes is eliminated.

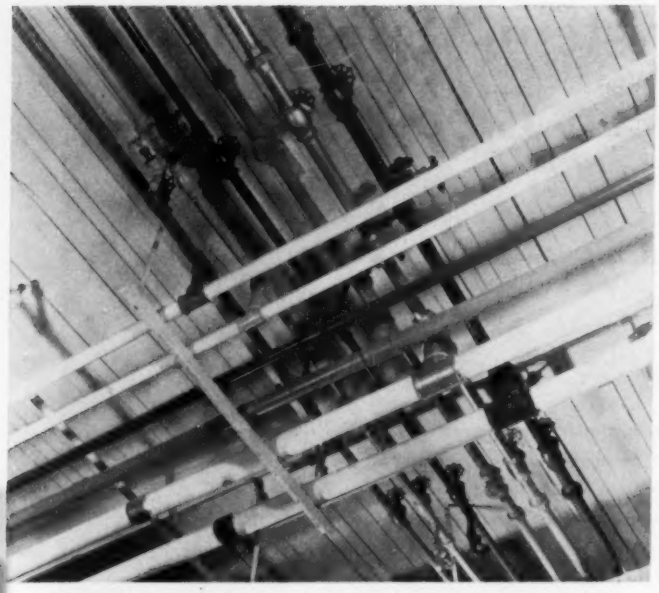
From the maintenance man's point of view, the standards perform an important function, for they supply much of the information that previously had to come from years of experience and instruction. This is true to the point that the entire emphasis of the maintenance supervisor's job is changed from that of technician to that of inspector and record-keeper. He must inspect jobs to see that the standards are maintained and he must have accurate records to be sure that there is an ample supply of standard materials ready for routine or emergency use.

In effecting maintenance, moves and rearrangements, it has proved imperative that mechanics know not only what the standards specify but also the reasons underlying the instructions. Without this understanding, it would be impossible to enforce the rules, for much of the plant's mechanical staff received its training in small plants where getting around immediate difficulties was usually more important than maintaining any semblance of orderly piping.

Keeping Gas and Air Leaks at Minimum

In the gas piping grid, a system had to be set up to keep leakage at an absolute minimum. This is true because of the fire danger from oxygen and hydrogen and also because of the serious economic loss from leakage of any gas.

In urging care, we established the costs of leaks in the various systems



THIS INTRICATE PATTERN of pipes symbolizes the variety and flexibility of the services available for manufacturing operations through the service distribution system of Western Electric's Allentown plant. Consisting of over 40 miles of piping, the service distribution system carries 13 different liquids and gases to various parts of the manufacturing building. The pattern illustrates how the system's piping grid divides the ground floor ceiling into successively smaller areas by successively smaller sizes of pipe. This system makes it possible for any of the manufacturing areas either above or below this piping grid to have easy access to cold city water, steam, condensate return, cold soft water, hot soft water, deionized water, house water, low pressure air, high pressure air, city gas, hydrogen, nitrogen and oxygen. For ready identification, the piping for each of the services is designated by a color code

and in spite of our expectations were surprised at the dollars-and-cents magnitude of these potential losses. For instance, we found that a 1/16 in. diameter leak in a 100 lb air line could waste 2 million cu ft per year which, at 8c per 1000 cu ft, equals $160 per year, or the entire output of a 500 cfm compressor for nine 8 hr days.

Compressed air is used as an example here because air is often considered to be "free" and because it does not leave a puddle, spot or smell. Another important factor in using air as an example is the good check information available on air leaks in the Compressed Air Handbook, which gives an impartial source for reinforcing our points. Once having convinced the dubious of the great losses to be sustained from air leaks it is easy to sell them on the nearly astronomical losses sustained from the leakage of generated gases.

Probably the greatest factor in keeping gas lines tight is careful attention to detail in installation. Before any new installation is considered complete, its gas lines are tested at 100 lb. After the installation work is completed, the gas lines fall into a six month schedule for soap testing at their normal operating pressures. During the tests, it is not always convenient to stop and repair leaks, for in many cases this necessitates purging with nitrogen, repairing the leak, then testing under nitrogen pressure, and finally reflushing the line with its own gas. For this reason small leaks are prominently marked for such times as repairs can be conveniently made without interrupting production.

Proper maintenance of hydrogen flash arrestors is imperative. These arrestors are reservoirs of ethylene glycol, at the bottom of which the incoming hydrogen enters through a check valve. The hydrogen then bubbles up through the liquid and proceeds to the outgoing line. In the outgoing line there is a safety valve that is vented to the roof. A flash cannot travel back through the arrestor because of the liquid barrier and the check valve. High pressure in the line is relieved by the safety valve.

Maintenance of Flash Arrestors

The simplicity of this design makes maintenance and checking simple. Each month, while a spare that is normally in parallel service provides protection, the safety valve is raised by nitrogen pressure from a cylinder. The check valve is tested at the same time by observing an outlet in the line between it and the inlet shutoff. In order to prevent possible trouble from thickening of the fluid, it is replaced annually.

Water and Steam Piping Maintenance

On the grids carrying several kinds of water and steam, no periodic check is made as leaks are obvious; however, on these lines, incidentals are checked on a regular six month schedule. Traps are replaced, dismantled and cleaned; strainers are blown down; and reducing stations are checked for accuracy of control as well as safety and cleanliness.

The reducing valves in the plant range from the 1/4 in. size that connects various small machines to the 6 in. ones that feed the air conditioning units. The reducing stations comprise shutoff valves, a reducing valve, a bypass, a strainer, a safety valve, a remotely connected control line and a gage. Each of these items is visually checked for signs of leakage, and the blowoff is raised both by pressure, as checked by a test gage, and by hand. The strainers are cleaned and the remote control line is blown down.

Wherever practical, traps, strainers, reducing valves, etc., are made up with standard length nipples to facilitate their removal and replacement with minimum interruption to service. When one of these specialties has been removed from service, it is taken to the maintenance shop

where — as a spare-time venture — it is rebuilt and put in stock for future use.

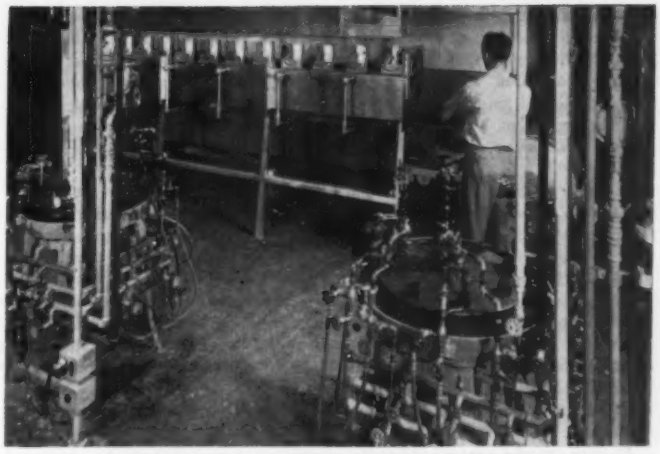
To facilitate the repair of these pieces of equipment, a special work bench and test station with all the required equipment and spare parts is provided. This facility has paid real dividends because it insures the use of proper tools and spare parts, provides adequate test equipment and makes it possible to assemble enough of one type of work to assure economical operation. In the field, the use of centrally repaired equipment has paid off through reduced failures and through the reduction of emergency maintenance work.

Five Independent Drainage Systems

Maintenance of the five independent drainage systems has also been largely a matter of careful watching to see that waste materials are put into the right drains. All cyanides but no acids go to the cyanide drains; all waste chemicals other than cyanides go to the acid drains; sanitary waste goes to the city sanitary sewer; and storm water and that alone goes to the city storm sewer or, through the plant's surface drainage system, to a sink hole. Caution is also observed to assure that proper notice is given to the plant's chemical disposal unit before any unusual chemical dump is made, to make certain that hot discharges are cooled before entering the tile drain pipes of the chemical system and to see that no oil, grease or solvents of any kind are dumped into the drains.

From a maintenance standpoint, one of the more difficult operations in the plant is the chemical waste disposal unit. Here, corrosive wastes are neutralized by equally corrosive reagents including caustic soda in solution and chlorine gas. Our major trouble arose from the chlorine which got into the air through a solution type chlorinator. Inasmuch as this chlorinator was also slow and troublesome to operate, we experimented with the direct feed of chlorine to the cyanide waste. We were successful by this means in reducing losses through chlorine leakage and high maintenance, and we also materially increased the speed of chlorination.

Small leaks in the caustic soda system necessitated substantial repairs so the system was repiped and moved from ceiling height to a position below knee level. This will make future maintenance much easier and will prevent the possibility of accidents from leaks of the caustic solution.



IN CONJUNCTION WITH Western Electric's manufacturing unit at Allentown, Pa., Bell Telephone Laboratories maintains a resident branch known as the Allentown laboratory. In the background can be seen the back end of a heat treating furnace used for annealing glass under rigidly controlled conditions. Glass parts frequently contain stresses which must be removed before the parts can be used in electron devices. This furnace removes the stresses by heating the glass to a point where it becomes viscous and the stresses "flow out" or are relieved. One of the features of the new furnace is that it allows almost any predetermined cooling cycle to be set up simply by opening vents in the cooling chamber and by changing the speed of the conveyor belt. At the right, William Feichtel removes annealed glass parts from the furnace. In the foreground are two conventional type glass "seal-in" machines

Continuous Effort Keeps Safety Record Up

Only continuous effort keeps the maintenance crews' safety records high. This effort takes the form of monthly safety meetings of the maintenance group, and frequent small group conferences of the mechanics. At these meetings, generalizations are covered but specific accident hazards take the spotlight. Any accident which occurred is discussed and analyzed, situations that might cause accidents if not corrected are aired for the benefit of the group, and time is always devoted to discussion of the use of safety and protective devices.

The importance of proper scaffolds is stressed, since the overhead piping makes for hazards to both the mechanics doing the work and to equipment and personnel beneath it. The plant piping standards come in for a frequent plug at the safety meetings, as maintenance of the orderly system they dictate goes a long way toward preventing accidents.

In these meetings and in the routine progress of the job, it has been noted that some of the most energetic and effective workmen seem to take their own safety for granted. With these people, progress was best made by pointing out that safety is a cooperative venture and that carelessness is as apt to injure others as it is to injure the offender.

Protecting the Condensate System

Early examination of the condensate system indicated some corrosion of the piping. In order to arrest this, we started feeding a patent chemical to the main steam line. This chemical, fed at the rate of 30 lb per 1 million lb of steam, lays down a monomolecular film on the inside of condensate return pipes. The film is non-wetting, and prevents

carbonic acid in the return from attacking the piping. Samples inserted in the system have been very carefully compared with others installed for equal lengths of time before the treatment was started and very satisfactory results have been noted.

The only problem that arose from the chemical came from a steam heated water still that developed a light white precipitate in its output. Checks proved that this was the chemical that was being fed for corrosion protection. This problem was solved by changing the hook-up of the still so that the condensate was returned to the boilers instead of being fed to the evaporating section of the still.

Routine checks are made on the fire sprinkler system. The fire reservoir is checked daily for level. The locked-in pressure in the building sprinklers is checked by gages each week and is released every three months to test the sprinkler alarms. The sprinkler heads are inspected for troubles such as insect nests, corrosion, paint fouling, etc., as frequently as is required by the location in which they are used.

Plant Has Hydrogen Alarm System

The plant's hydrogen alarm system will sound whenever minute quantities of hydrogen or hydrocarbon are present in the air. The system in use takes samples of air from various points in the plant and pipes them to a central instrument where the samples are passed over a platinum element that is heated catalytically if the sample contains hydrogen. This heat unbalances a wheatstone bridge which sounds the alarm for the location from which the sample came. The system itself is rugged but weekly tests are made to be certain that no trouble has developed. The test requires an inspector to visit each alarm station and, at a prearranged time, expose each sampling head to cyclohexane fumes. A record of the alarms is kept by another inspector.

Maintenance of the Pneumatic Control System

For sheer complexity, the plant's outstanding piping system is that for the pneumatic control of the air conditioning system. By means of this piping, local control of temperature and humidity is maintained on each of the 19 air conditioning units. Reset of this local control is afforded at a central control room. Maintaining the system necessitates guarding against three hazards — piping failures, equipment failures and errors in judgment. Piping failures have been surprisingly few; there having been but three in two years. Failures of various control components have likewise been few on a unit basis, but the great number of units has made even this infrequent failure sufficient to occupy most of the time of one maintenance man.

The major problem in the operation of the air conditioning system has been instilling an analytical approach in the minds of operators. Starting with all inexperienced men, we of course made our share of mistakes. However, analyzing each error as an error in approach rather than as an independent mistake has given very satisfactory results. Now, each complaint of trouble is analyzed first as to its cause, second as to the measures necessary to correct it and third as to other results of the corrective action.

In the humidifying pans of the air conditioning system, a peculiar reduction in effectiveness was observed through the first season. At the end of the season, a careful examination of the pans disclosed a smooth, hard, eggshell-like scale on the steam pipes. During the second season, a daily blowdown of these pans kept the concentration of minerals so low that no further scale was deposited and the old scale was gradually carried away.

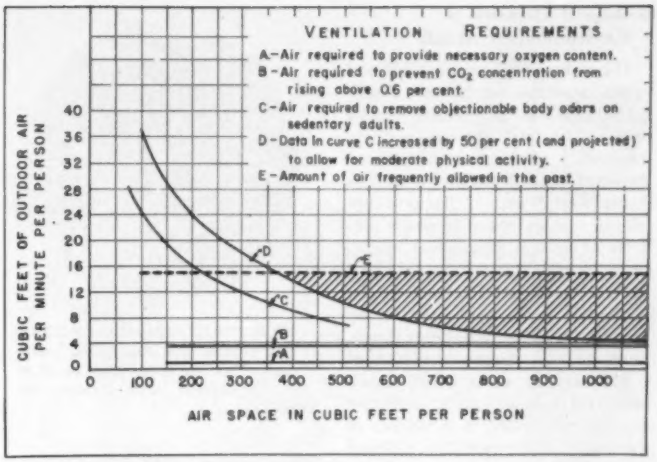
In general, maintenance experiences have vindicated the original plan of the plant's piping. Use of proved, modern equipment and standardized layouts with provisions for alteration and expansion are as vital on small, simple jobs as on large, complex ones.

MANUFACTURE OF ELECTRONIC apparatus for telephone, radio and radar work requires 13 different piping services throughout the manufacturing building at Western Electric's Allentown plant. Suspending the piping from the basement ceiling eliminates need of drop piping on the main floor. The pipes in this picture are identified by color code, carry low pressure air (blue), city gas (orange), oxygen (green), hydrogen (red) and nitrogen (yellow)

ENGINEERING SCHOOL TO HOLD SUMMER SEMESTER

TO MEET THE present emergency, the Schools of Engineering and of Mines at the University of Pittsburgh will conduct a regular 12 week summer semester from June 18 to September 7 for freshman, sophomore, junior and senior students.

The summer programs for these students will be part of the total program in which they are enrolled. Courses will be offered as they are justified by enrollment. It will be necessary for any student not attending the summer semester to make application for readmission for the fall or any subsequent semester.



ABOUT 10 CFM OF FRESH AIR is required per person to avoid vitiation, as shown in this graph taken from an article by George W. Meek published in the August 1942 HPAC

Protective Shelters in Modern Warfare

By Warren Viessman
Director, Heat & Power Div.
U.S. Naval Civil Engineering Research and Evaluation Laboratory

Shelters in modern warfare are intended to afford a degree of protection to personnel and material against environmental attack. While active offensive and defensive measures are constantly in a state of flux, the elements of attack can be analyzed and protective measures developed. Atomic attack necessitates protection against blast, heat and radiation. The intensities of these elements are discussed and design information provided for various degrees of protection. Environmental airborne attack may be either chemical, biological or radiological. Permissible threshhold limits are given. Protection can be accomplished by sealing the shelter, maintaining an internal pressure in excess of the atmosphere so that exfiltration occurs, providing air locks and decontamination facilities for entry during attack, and cleansed air for pressurization and to avoid vitiation.

WHEN THE NEANDERTHAL man had the good sense to creep out of the rain and into the warmth and protection of a cave, the primary purpose of shelter was established.

Shelters in modern warfare must serve not only to protect personnel and material against rain, snow, heat, cold and wind but against various elements of military attack —blast, heat, radiation and airborne particulate and non-particulate chemical, biological and radiological contaminants.

Chemical Elements of Environmental Attack

Gases used in modern warfare are —even in small concentrations— poisonous, extremely irritating and burning. Inhalation of certain gases for a sufficient length of time, no matter how small the quantity, will result in a casualty. To some gases, there is immediate reaction; others produce effects after considerable delay. Warfare gases are classified as non-persistent, persistent and toxic [see Kinds of Gases, Bluejackets Manual, U. S. Naval Institute, 1940, 744].

Non-persistent gases, such as chlorine and phosgene, are substances that under ordinary atmospheric conditions form gas clouds immediately upon the bursting of the shell or bomb container. These are obtained from liquids that boil at very low temperatures and vaporize readily. They localize for only a few minutes.

Persistent gases, of which mustard gas is an example, are formed from liquids which boil at a very high temperature and vaporize slowly. When such gases permeate a warm shelter, they constitute a serious menace until the air is entirely cleared.

Toxic Smokes. Some toxic gases are dispersed in extremely fine, solid particles, like dust or smoke, and are referred to as toxic smokes. The particles themselves are irritating, toxic and slowly give off poisonous vapors. They may be used in shells containing, in addition, a large amount of high explosive. Gases referred to as "d.a." (diphenylchlorisine) and "d.m." (diphenylaminochlorisine) belong to this class.

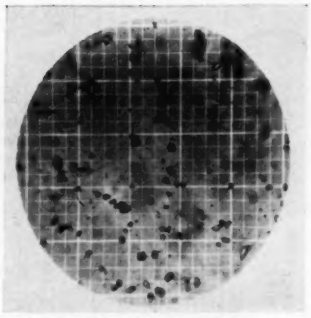
Biological Elements of Environmental Attack

There are many bacteria, fungi and viruses available for military attack. Large quantities of cultures can be prepared at little expense, and are therefore a weapon within reach of the small or weak nations as well as the powerful ones. Bacteria are microscopic and submicroscopic particles of various shapes and dimensions from 1/100 micron to 10 or more microns [see Bacteriology for Beginners, Peace or Pestilence, by Theodor Roseburg, Whittlesey House, 1949, 22]. A micron is 1/1000 of a millimeter or about 1/100 the diameter of a human hair. Infection may be transmitted in a number of ways, such as by insect bite, polluted water and food, or by means of contaminated air supplied to the respiratory organs. This latter method lends itself readily to use in warfare, as germs can be sprayed or discharged by bombs from airplanes to permeate the field of operations.

Some bacteria have permanent effects while others produce only temporary results. Some destroy the initial host but are not readily transmitted from person to person. Nearly all notorious agents of laboratory infections can be sprayed through the air. Among the most common that may be transmitted by the atmosphere are glanders, tularemia (or rabbit fever), brucellosis (or bang's disease), typhus, yellow fever, and psittacosis (or parrot fever).

Elements of Atomic Attack

Blast—With the advent of the atomic bomb, radioactive particles have also become an important element of environmental attack. If the structure or shelter is sufficiently close to the point of atomic explosion, severe blast pressures and heat waves are experienced. When a "normal" atomic bomb releases energy equivalent to 20,000 tons of TNT and is exploded at an optimum height of 2,000 ft, virtually complete destruction will occur out to a radius approximately ½ mile from the "ground zero" point. Larger atomic bombs, equivalent to 40,000 tons of TNT, would increase the radius of the various zones of destruction by about 25 percent. A normal atomic bomb explosion occurring at the optimum height creates reflected pressures on the ground ranging from 75 psi directly underneath, 30 psi at 1100 ft from ground zero, 10 psi at 4000 ft and 3 psi at 8000 ft.



MICROPHOTOGRAPH COUNTS are used to determine atmospheric pollution. This one is for particles of 20 to 40 microns. Scale divisions are 50 microns

A pressure of 10 psi will collapse average commercial and industrial buildings; 3 psi will collapse average residences. A pressure of 150 psi or more is needed to injure or kill average humans by direct compression. Within 10 seconds, the shock wave has traveled 12,000 ft and becomes so weak that it no longer produces damage. The pressures experienced might damage certain underground structures superficially buried in the ground. Metal piping in the ground would probably not be damaged, but shallow tile sewer lines and drains would be subject to damage by earth shock. Even directly underneath the burst, moderately strong underground structures would probably be undamaged [see Damage from Air Blast, Damage from Atomic Explosion and Design of Protective Structures, NSRB, Govt. Printing Office, 1950, 9].

Heat—An enormous amount of heat radiation is emitted within the first 3 seconds by the ball of fire after detonation. In 15/1000 seconds it is 600 ft across and its outside temperature is 9000 F. This brief flash is sufficient to burn persons 2.5 miles from ground zero, scorch wood at 2.2 miles, ignite dry combustible material for 1.8 miles and cause death to persons exposed to it within a radius of 0.8 mile [see The Atomic Battlefield, by D. B. Parker, Military Engineer, Vol. XLII, No. 289, Sept.-Oct. 1950, 344].

Radiation—Fission products or bomb residue produce nuclear radiation (gamma rays and neutrons) for some time but the rise of the ball of fire and the attendant convection currents have carried most of them far above the earth's surface, so that after 10 seconds, they are absorbed by the air before reaching a target. Of the fission products sown by other means than a bomb, or remaining from bomb fragments, the neutrons, while very deadly, have a range in air of only 1800 to 2400 ft.

Location and Design of Underground Shelters

Extensive underground facilities, factories and shelters have been constructed in Sweden, Germany, Japan and Italy. The Swedish cavern, for airplane engine production, was located on a hillside and tunnelled from solid rock. All utilities, including air conditioning and transportation, were provided. Cooling rather than heating was necessary most of the year.

About 16,000,000 sq ft of underground floor area had been made available in Germany by the end of 1944. In general, the expense of underground structures has been found excessive, and the facilities were often damp and otherwise unsatisfactory.

The most desirable sites were found to be on the sides of hills and mountains. Such locations are dryer and less likely to give trouble from ground water. Side-hill locations also make installation of sewers easier, afford more adequate ventilation and usually provide better entrances and exits [see How Underground Factories Performed, Engineering News Record, Oct. 14, 1948].

Present indications are that it is not economically feasible to go underground in the United States, except where suitable caverns are available and can be conveniently modified for military shelter.

Power plants, transformer banks and water supply facilities can utilize the advantages of underground protection from atomic attack to a greater extent than can shelters for industry or personnel. When the utilities are destroyed, the dependent

industry or activity becomes paralyzed.

A static load of 500 psf, with usual design stresses, has been suggested for underground shelters. This should provide protection against blast at ½ mile from ground zero, if an earth cover of at least 2 ft is provided. This cover is necessary for protection against ionizing radiation and should also add appreciably to the blast resistance [see Shelters, Damage from Atomic Explosion and Design of Protective Structures, NSRB, Govt. Printing Office, 1950, 31]. Dead load should be figured separately. Adequate drainage should be provided. The shelters should be capable of being closed so as to be airtight. Doors should be blast resistant, designed for a static pressure of 500 psf and should close tightly against seals in the frame. Air intakes and exhausts should be blast resistant. Ventilation and air conditioning, together with sanitary, lighting and communication facilities, should be provided.

Design and Dispersion of Surface Shelters

It is impractical, in most cases, to design surface structures for protection against a near atomic blast [see Engineers in Atomic Offense and Defense, by D. B. Parker, Military Engineer, Vol. XLII, No. 288, July-Aug. 1950, 257]. For the protection of multi-story reinforced concrete or steel frame buildings against structural collapse due to the explosion of a normal atomic bomb at a horizontal distance of ½ mile from ground zero and at a height of approximately 2000 ft, it has been recommended that the building be designed for a horizontal wind component of 90 psf and a vertical component of 70 psf [Recommendations on Construction, Damage from Atomic Explosion and Design of Protective Structures, NSRB, Govt. Printing Office, 1950, 27].

A 12 in. thick reinforced concrete wall around an existing building or shelter area, well tied into the outer structure, would, in most cases, be adequate air blast protection at a distance of ½ mile. For greater distances from the ground zero point, less protection is required.

Shelters for personnel or material should be located at strategic points, dispersed [National Security Factors in Industrial Location, NSRB, 1948, Washington, D. C.] with respect to each other, and provided with utilities such as transportation, electricity, water and air conditioning—depending upon their use.

Dispersion of buildings used as shelters for vital personnel and industry is the more economical and practical approach, rather than endeavoring either to go underground or construct a shelter to withstand shock, heat and radiation in close proximity to an explosion. Necessity for complete protection is not as great where shelters are dispersed, and where vital personnel and material are not all in the same target area.

ATMOSPHERIC AIR SAMPLING for bacteria is illustrated in this official photograph from the U.S. Navy

Air Contaminants Affecting Shelters

Dusts are among the solid particulate air contaminants affecting any shelter. They are solids projected into the air by natural forces such as wind and volcanic eruption or by mechanical processes such as crushing, grinding and blasting. Dusts vary in size from 1 micron to over 100 microns, may be of mineral, vegetable or animal matter. They are important carriers of chemicals and germs, and may be radioactive.

Fumes are solid particulate matter usually formed by the condensation of vapors from normally solid materials such as melted metals and from sublimation, distillation, calcination or chemical reaction, whenever such processes create airborne particles predominantly below the 1 micron size.

The extremely small solid particles produced by incomplete combustion of organic substances such as wood, coal, oil, tobacco and other carbonaceous materials are usually classified as *smokes*. The finest particulate constituents of smoke are much less than 1 micron in size—often in a range of 1/10 to 3/10 microns.

Mists are among the liquid par-

PRESENCE OF BACTERIA is determined by sampling and shaking out onto petri or culture plates which provide moisture and food for the bacteria and spores. This microphotograph of a petri plate shows mold spores and micro-organisms in ordinary outdoor air

ticulate air contaminants. They are very small airborne droplets of materials that are liquids at normal temperatures and pressures; they may be formed by atomizing, spraying, splashing, etc.

The term *fog*, as well as mist, is used to indicate the particulate state of airborne liquids commonly termed aerosols. In a more limited manner, fogs are considered as airborne droplets formed by condensation from the vapor state. Many droplets in fogs or clouds are microscopic and submicroscopic in size and may be conceived as a transition state between the larger mists and the vapors.

Vapors are non-particulate air contaminants. They are gaseous phases of substances that are either liquid or solid in their commonly known state—examples are gasoline, benzine, carbon tetrachloride and camphor. These vapors are removed from the air by condensation with less difficulty than are gases.

Gases are classified among the non-particulate air contaminants. They are normally formless fluids which tend to occupy a space or enclosure uniformly and completely at ordinary temperatures and pressures. Oxygen, hydrogen, carbon dioxide, ammonia and sulphur dioxide qualify as gases [see Air Contaminants, Heating, Ventilating, Air Conditioning Guide, ASHVE, 1950, 153].

Bacteria is a general classification for germs or living organisms, and consist of approximately 50 percent carbon [see Chemical Compositions of Micro-organisms, Bacterial Chemistry and Physiology, by J. R. Porter, John Wiley & Sons, 1947, 358]. Bacteria possess two distinct properties: they are so small that they cannot be seen individually and are able to reproduce their kind inside of larger bodies. There are seven or eight broad classes of bacteria, fungi and viruses, with many different varieties in each. Bacteria particules are of various shapes, from 1/5 to more than 1 micron thick and 2 to 10 or more microns long.

Viruses are micro-organisms ranging in size from about 1/100 micron up to the size of the smallest bacteria. They are very difficult or impossible to segregate and destroy.

Fungus spores are micro-organisms ranging in size from 1 to 10 microns.

Pollen is a fine powder formed by flowering plants. Pollens range in size from 5 to 150 microns. Because of their size, they are easy to filter or segregate and are therefore not likely to be used directly as an important carrier or military weapon.

Radiological elements scattered by an atomic explosion are of submicroscopic size. The active material is dispersed initially in the form of a vapor or gas. Nearly all of it is later adsorbed by particles of dust or droplets of water. These contaminated particles range in size within the approximate limits of 0.1 to 10 microns [see Protection Against Atomic Bombs, by Wm. W. Stone, Radiological Defense, Vol. III, Armed Forces Special Weapons Project, 91]. Protection against such radioactive particles is obtained by filter media effective for the particular sizes mentioned and by the screening of the protective shelter.

Lethal effects will be produced by atomic bombs over an area of 2 square miles and measurable effects will be felt over an area of 7 square miles, as a result of the gamma radiation emitted at the time of detonation [see The Atomic Bomb and the Resultant Phenomena, by H. Scoville, Jr., Radiological Defense, Vol. III, Armed Forces Special Weapons Project, 91]. Except in the center of a low altitude explosion, the residual radioactivity is of very little importance. After detonation, a high intensity of gamma rays is immediately emitted. These rays travel at the speed of light, are highly penetrating and a large amount of material is required to absorb and stop them. As a basis for design, the effectiveness of a shield is often described as the thickness of the material which is necessary to reduce the intensity to one-half the initial amount. This is called a "one-half thickness" of the material. Very rough one-half thicknesses of common construction materials are 1 in. for steel, 3 in. for concrete and 4 in. for wood or earth. These are useful design figures.

Neutrons also constitute detonation hazards but are not nearly as effective at great distances as are the

gamma rays. They do not require consideration close to the bomb. Because neutrons are uncharged particles, they are difficult to stop and shield against. The weight of the shielding material is not the important factor. Instead, the ability of the particular chemical or element to slow down and then capture the neutrons is the important characteristic. The best materials for slowing down fast neutrons are those with low atomic weights, such as hydrogen and hydrogen compounds —as, for example, water or paraffin. Very rough one-half thicknesses of common structural materials are between 3 in. and 12 in. for steel, about 6 in. for concrete or wood and about 6 in. for water.

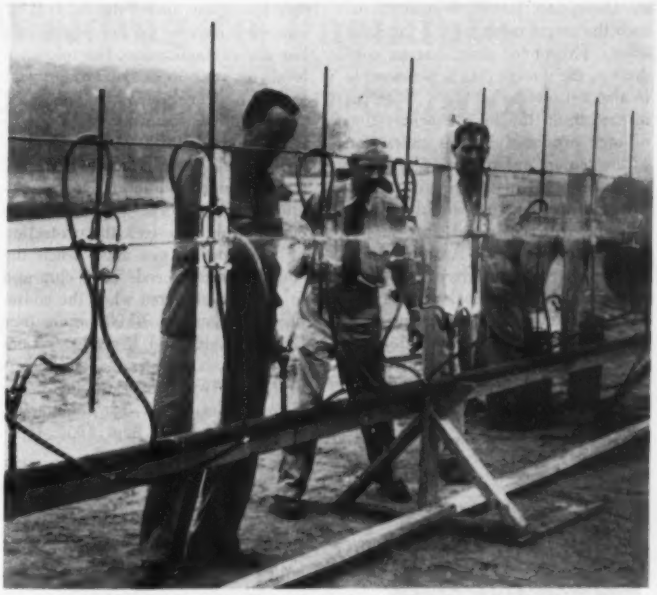
Unless the base atomic surge is surrounding the shelter in question, the beta radiation is not important, due to the shielding furnished by the air. The range of beta radiation in air is roughly but 3 to 4 yards.

Alpha radiation occurs from nonfissioned plutonium or uranium. Normally, this radiation constitutes no external hazard to a person, as the skin furnishes shielding. However, if a plutonium particle of, say, 1 micron size should pass within the structure through ventilation air, and find its way into the respiratory tract of an individual, serious damage would be caused the living tissues.

Threshold Limits for Air Contaminants

Atmospheric pollution has been the cause of extensive studies. There is considerable interest and activity in the control of air pollution factors in metropolitan and industrial districts. If the shelter could be sealed from the outside air, the problem would be relatively simple, but about 10 cfm of fresh air per person must be supplied to avoid vitiation, depending on shelter size and other conditions [from Your Place in the "Smart Man's" War, by George W. Meek, Heating, Piping & Air Conditioning, August 1942, 463].

Dust concentration ranges in rural and suburban districts vary between 0.05 to 0.5 mg/cu m. The range in metropolitan districts is 0.1 to 1.0 mg/cu m and in industrial districts 0.2 to 5.0 mg/cu m. Excessively dusty factories and mines have dust concentrations ranging from 10 to 1000 mg/cu m. For most mineral dust having less than 5 percent silicon dioxide, the suggested maximum working level or threshold limit has been given as 50,000,000 particles per cu ft of air, standard light field count. Concentrations are determined by discoloration and sedimentation methods [see Particle Size, by L. W. Briggs, Western Precipitation Corp.], microphotograph counts, weight analysis, and photoelectric cell light methods.



A LABORATORY ARRANGEMENT for biological attack is shown in this official U.S. Navy photograph

In the case of toxic dusts, fumes and mists, it is difficult to say what concentrations of the various chemicals may be considered safe. It is also not known what chemical gases might be used by an enemy. For design purposes, however, cyanide has a suggested maximum working level concentration or threshold limit of 5 mg/cu m. The fluorides have a suggested threshold limit of 2.5 mg/cu m. Other dusts and fumes go down to values as low as 0.1 mg/cu m.

The concentration of bacteria creating a potential health hazard in a given environment depends upon the germ, the state of health of the host or individual, atmospheric and perhaps other conditions. Within enclosures and shelters, airborne organisms, varying from 1 to 1000 per cu ft of air, have been reported, the count depending somewhat upon the method of testing. Many of the bacteria are attached to particles of dust present in the air. In some cases, perhaps one germ per 1000 cu ft of air may be a potential health hazard and cause infection; in other cases, perhaps 10, 100 or even 1000 organisms per 1000 cu ft of air would be required to cause serious infection.

The presence of bacteria is determined by sampling, and shaking out onto petri plates or culture plates containing a gelatin which offers both moisture and the food necessary for the growth of the bacteria and spores. The plates are usually kept at body temperature for a period, during which time a whole colony of bacteria appears where only one fell. Records are made by a microphotograph process.

Radiation affects tissue only through absorption. If a gamma ray passes through the body with no loss of energy, it produces no effect. Only those photons which interact with the tissue and lose energy produce biological effects. The measure of radiation received, or dosage, is the product of the incident energy times the surface area exposed times

an absorption factor dependent on both the target material and the radiation. Except for short disaster conditions, the dosage that is permissible is also a function of time. With an intense flash, the high concentration of ions produced by the interaction of the radiant energy with tissue may overwhelm the tissue repair mechanisms that otherwise would be able to cope with sustained but smaller ionic concentrations. An alpha, beta or gamma ray exposure of 0.3 roentgen equivalent physical units (rep) for any one week may be permissible [see Residual Nuclear Radiation and Contamination, The Effects of Atomic Weapons, Atomic Energy Commission, Supt. of Documents, Washington, D. C., Sept. 1950, 249]. Military operations under the hazards of war may require greater exposures. For air contamination, the tolerance level for the more hazardous and common beta-gamma radioisotopes such as iodine, strontium and barium, is considered to be 10,000 counts per minute for a sample collected from an electrostatic air cleaner operating at 11.5 cfm. Therefore, the general rule is to seek the protection of a shelter or gas mask when the counting rate exceeds 1000 cpm and to evacuate the area when the counting rate exceeds 10,000 cpm [see General Rules and Procedures Concerning Activity Hazards, The Effects of Atomic Weapons, Atomic Energy Commission, Supt. of Documents, Washington, D. C., Sept. 1950, 469].

Measurement and detection of alpha, beta and gamma rays is done with an ionization chamber, the Geiger-Mueller counter, photographic film meters and other detectors [see Radiation Monitoring Instruments, The Effects of Atomic Weapons, Atomic Energy Commission, Supt. of Documents, Washington, D. C., Sept. 1950, 304].

[Mr. Viessman's next article will discuss sealing and pressurization of chambers, air locks and decontamination, ventilation and leakage, filters, washers, activated carbon adsorbers, ultraviolet radiation, glycol vapors, sonic agglomeration, cyclonic scrubbers and selection of air cleaning methods.]

. . . . . on Air Conditioning Operation

WE USE DEEP WELL water for condenser cooling, and find from time to time that sand lodged in the tube passes, together with a slime bacteria coating, reduces efficiency. It is therefore necessary to remove the accumulation before it becomes troublesome without removing the heads of the condenser, thereby causing condenser outage.

The necessary connections were installed as shown in the sketch on the condenser side of the block valves. These consist of welded spuds, globe valves and nipples.

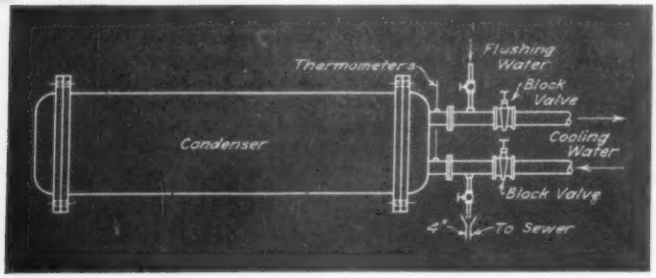
The method of operation is simple. By means of thermometers in the water circuit, a daily log of temperature readings is kept. When the efficiency is impaired to a point where it is deemed necessary to flush, a standby condenser is cut in and the block valves are closed on the dirty condenser.

Cold flushing water at 40 psig is shot through the tube side for 10 min until the effluent runs clear. It is astonishing to see the dirt and slime pour out as a result of the backwashing operation.

In this way, heat transfer efficiency is brought back to a reasonable value. We are providing all our heat exchangers of the shell and tube type with such backwashing connections so as to eliminate much outage time.

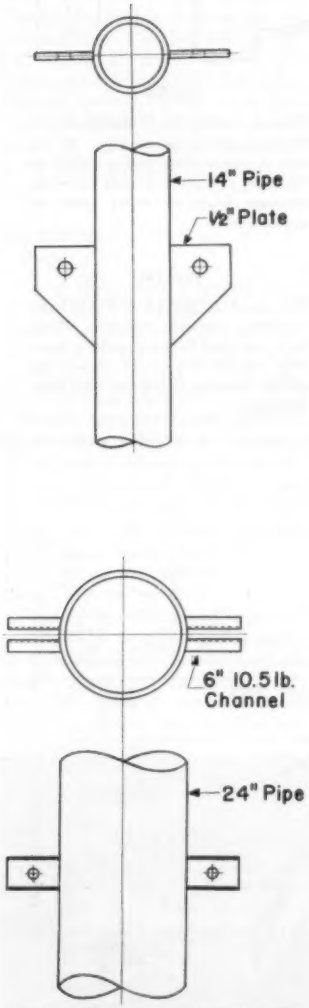
In order to reduce the amount of dust entering our air conditioning system through roof air intakes we have established the practice of providing gravel roofs at such locations. This keeps dust from swirling around in a wind because of the baffle action of the gravel, as indicated in the sketch. During a rain, the accumulated dust is washed away, leaving the gravel to pick up another load. —JOHN D. CONSTANCE.

BACKWASHING CONNECTIONS installed on condensers using deep well water are used to remove accumulation of sand and slime to keep heat transfer efficiency from being impaired



GRAVEL ROOF near air intakes helps to reduce amount of dust taken into the air circulating system due to the "baffle action" of the gravel, as indicated here

Use of Welding to Facilitate Piping Suspension and Support



FIGS. 1 AND 2—ATTACHMENTS welded to vertical pipes which are to be supported at an intermediate point in height by means of rods from the structure above

George W. Hauck, Manager of Engineering Sales, Crane Co., has assembled here a variety of actual examples showing how the use of welding can facilitate the suspension and support of power and process piping systems. He stresses that provision for adequate suspension or support should be part and parcel of the original design, as good planning in advance pays dividends

WELDING can be utilized advantageously for fabricating and attaching accessories to piping. . .these attachments, in turn, provide extremely useful adjuncts for the suspension or the support of many portions of piping systems.

The welding of joints in piping is accepted practice today; no brief is necessary in its behalf. Likewise, it is recognized now that no piping system is better than the means provided for its suspension and support and much more attention is being devoted to this detail of piping.

In contemplating either welded construction or the suspension and support of piping, it is realized that both subjects have been dealt with individually in much published data. It is not intended, therefore, that this article should deal with either the welding or the suspension and support of piping as such. However, there is room, as a separate subject, to discuss how these two arts can be integrated advantageously.

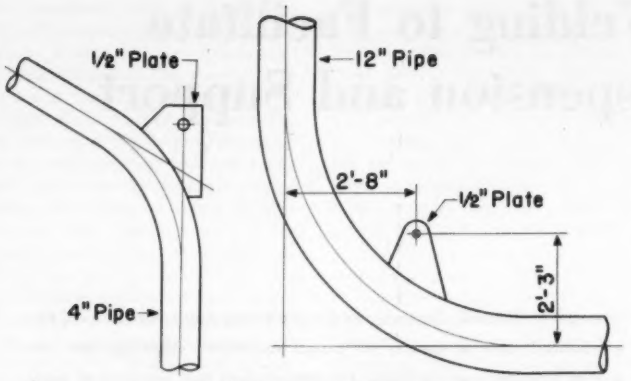
Lugs and brackets, in a wide variety of shapes, are typical of the accessories which can be welded readily to piping in order to facilitate the attachment of suspension materials. Similarly, welded bases typify the attachments for piping which simplify its support.

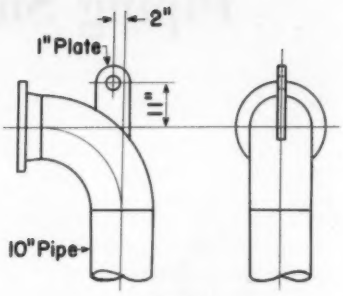
Before this theme is amplified, it may be well to differentiate "suspension" and "support" with respect to piping. The basic difference between piping suspension and support is self-explanatory. Suspension refers to the practice of hanging piping from the structure above it by means of hangers, rods, springs, beam clamps and the like. With supports (of various types) the piping load is supported from below. Usually, good design employs a combination of suspension and support, each being applied where it is the more effective and practical solution. The convenience and simplicity of welding as a means to facilitate the suspension or the support of piping should not be overlooked.

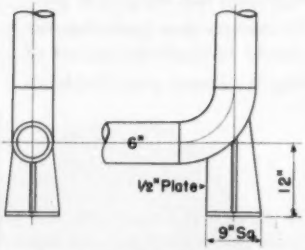
Suspension of Piping

Figs. 1 and 2 show typical attachments welded to vertical pipes which are to be supported at an intermediate point in height by means of rods from the structure above.

Figs. 3, 4 and 5 are typical of welded lugs which facilitate the suspension of piping from above. Frequently, a lug such as one of these can be welded to piping at a location which is directly below an adequate beam or other point of suspension. Contrastingly, shifting the point of suspension to adjacent straight pipe in order to use a hanger may entail the installation of auxiliary steel for the overhead terminal of the hanger.







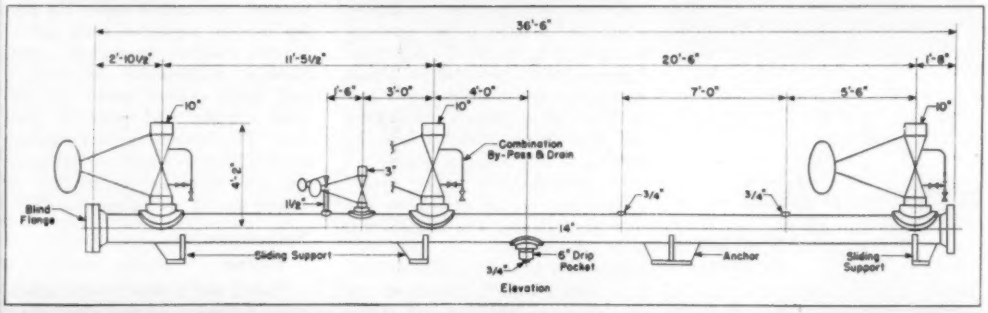
FIGS. 6 AND 7—WELDED BASE can be applied below a welding elbow for support of a riser, if horizontal run doesn't change elevation due to thermal movement

ABOVE

FIGS. 3, 4 AND 5—WELDED LUGS facilitate suspension of pipe. A lug such as one of these can be welded to piping at a location directly below an adequate beam or other point of suspension

BELOW

FIG. 8—ADEQUATE SUPPORT for a header assembly weighing 12,200 lb is provided by these welded bases. This combination of an anchor and sliding supports is popular with many designers



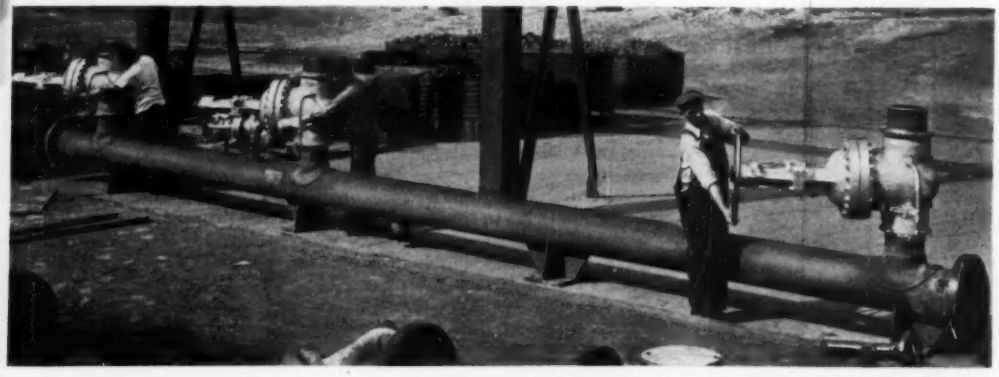
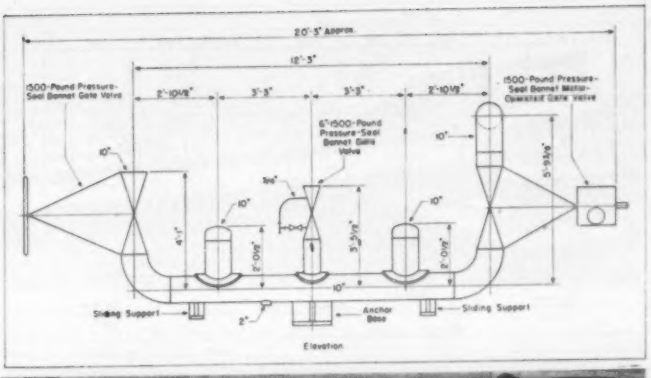
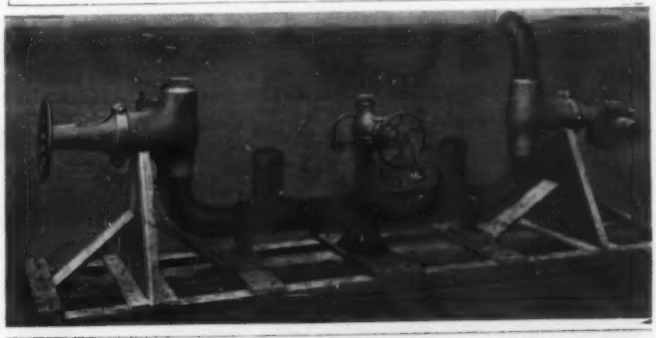
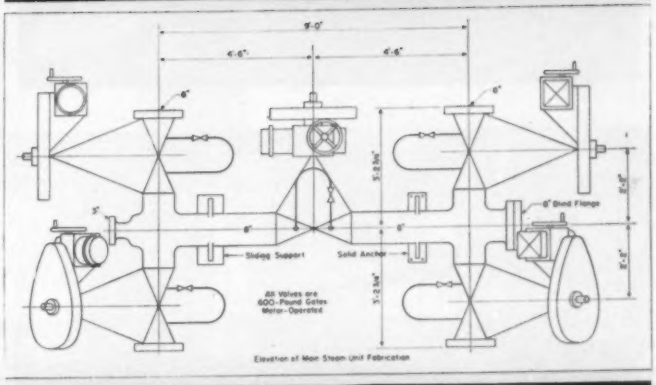


FIG. 9—WELDED ANCHOR BASE and sliding supports applied to 10 in., schedule 160 alloy main stream header. The assembly pictured weighs 8700 lb







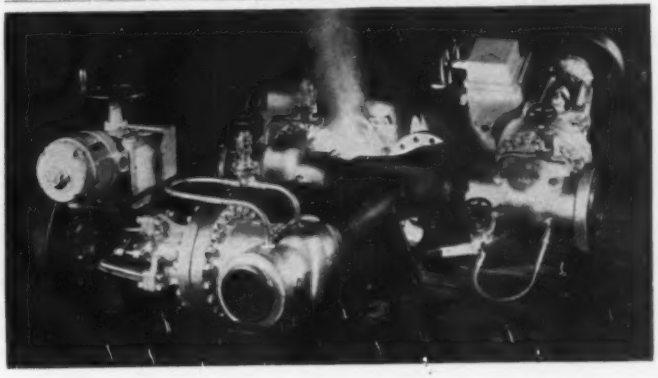


FIG. 10—COMPLETE HEADER assembly with five motor operated valves, the total weight being 6 tons. Photo shows assembly during fabrication and after anchor base was welded to header

This suggestion is not intended to discredit the use or the value of pipe hangers. The bulk of piping is effectively suspended with hangers. The welded lugs are a supplementary device and are especially adaptable when curved sections of piping are involved.

Fig. 4 illustrates this distinction between the choice of a hanger or a welded lug. This lug was located 2'-8" from the center line of the vertical riser of a pipe bend in order to locate the hole on the center line of a beam above, making it a simple matter to complete the suspension at this point with a beam clamp and rod.

Support of Piping

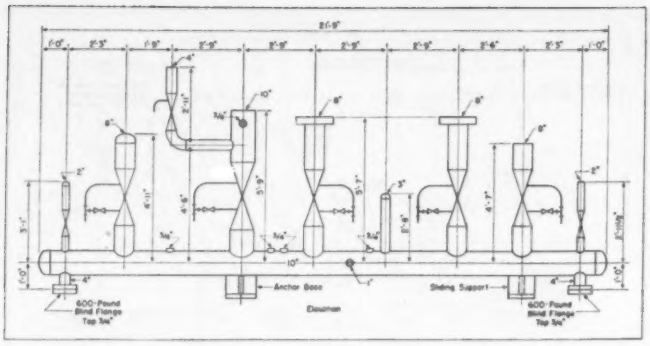
Fig. 6 shows how a welded base can be applied below a welding elbow to provide adequate support for a riser, if the horizontal run of pipe does not change in elevation due to thermal movement.

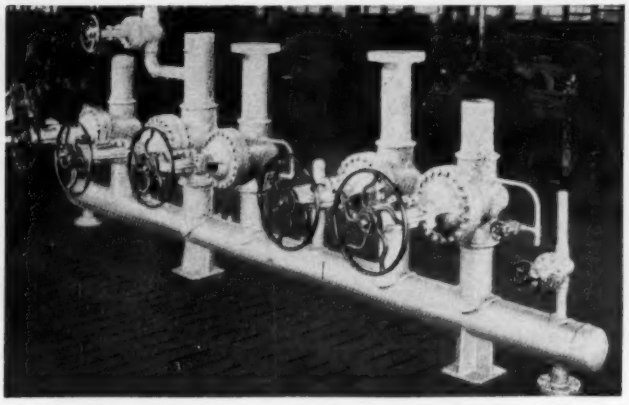
Welded bases are most effective in providing support for headers and sections of piping which usually involve concentrated loads of no mean proportions and can be supported best from below. The accompanying illustrations show a variety of welded bases, anchors, sliding supports, etc.

The usefulness of welded lugs and bases can be amplified pictorially. The accompanying reproductions of actual designs and the pictures of fabricated piping portray how welded attachments can facilitate the support of piping.

Avoid Improvising, If Possible

Provision for adequate suspension or support should be part and parcel of the piping design, and not left to the chance that satisfactory solutions can be improvised in the field during erection.





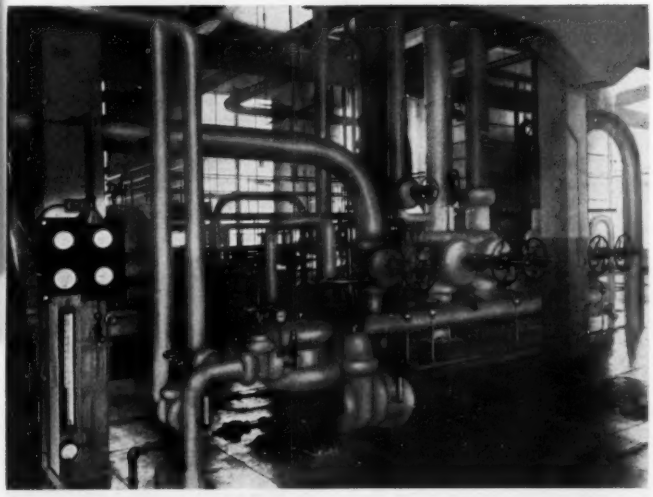


FIG. 11—LAYOUT OF HEADER assembly, complete header after fabrication, and header after its installation. Unit weighs 9850 lb, and welded bases provide adequate support for the concentrated load. Providing supports in advance of installation simplified erection; complete assembly was simply set on concrete pads and anchor secured with bolts

If the design of the piping is complete, all important points of suspension or support will be detailed. Then the lugs, bases, etc., can be welded to assemblies when they are fabricated. For example, this procedure was followed for each of the fabrications shown in the illustrations.

If such welded attachments are provided initially, erection and completion of the piping system are expedited. Assemblies as illustrated can be set in place and the permanent suspension or support installed simultaneously. The need for temporary support or suspension is eliminated. It is unnecessary to follow up later and to improvise for supports by using whatever steel happens to be handy or available.

Good planning in advance will pay dividends when erection takes place later.

CONSTRUCTION ESTIMATE REVISED UPWARD

F. W. DODGE's estimates of construction volume for 1951 as published last November have been revised slightly upward as a result of recent developments in the defense mobilization program, it was announced last month.

Thomas S. Holden, president, and Clyde Shute, head of the Dodge statistical and research division, also revised their viewpoints as to the nature of 1951 construction. It is the direction of their revision — an outlook for more construction rather than less — that is regarded as significant, rather than the size of the change.

They now expect a total decline of 18 percent rather than the 19 percent previously expected, as compared with the record-breaking construction volume of 1950. They anticipate that the recently ordered restrictions on commercial building will be more than compensated by increases in manufacturing plant, power plant, direct military building and civil defense construction.

An optimistic view is taken by Messrs. Holden and Shute as to the status of the construction industry beyond 1951. They think that 1951 may well prove to be a transition year toward the close of which the country will have geared itself into a defense economy that will be able to support increased construction volume in future years.

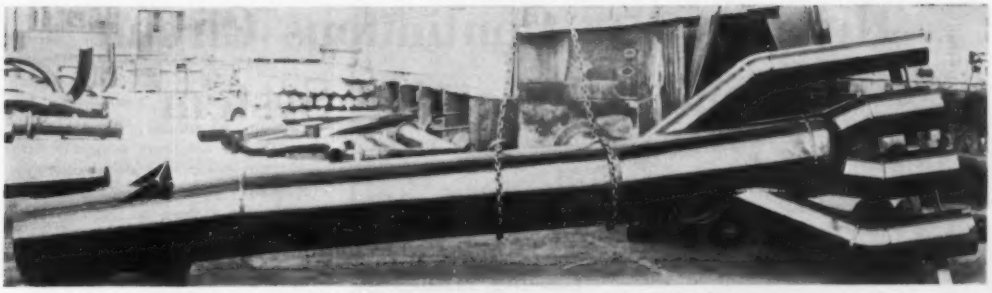


FIG. 12—ATMOSPHERIC VENT manifold for escape piping of pop safety valves. Main riser is 20 in.; inlets are 8 and 10 in. Welded lugs at left of photo provide support through attachment to adjacent structural steel

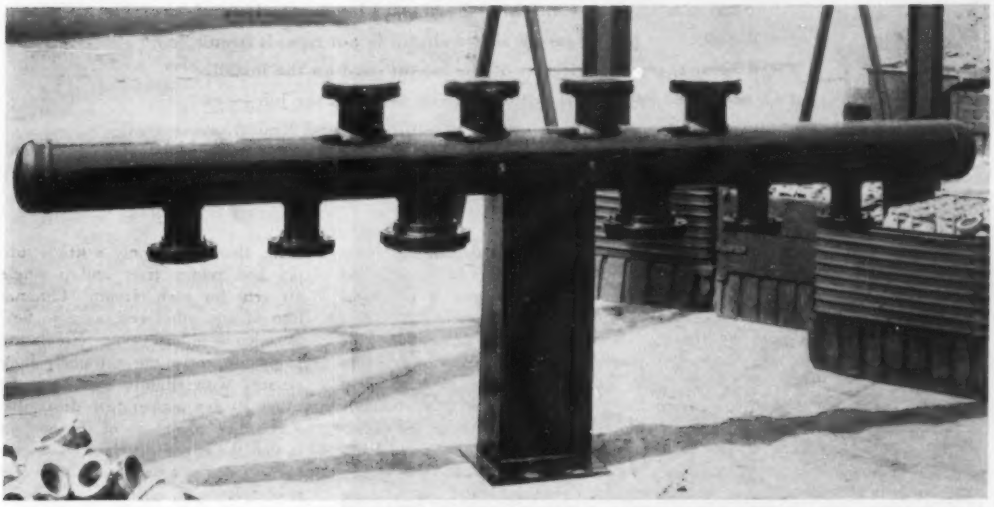


FIG. 13—UNUSUAL WELDED BASE support for this header was carefully designed to suit installation conditions. In addition to welded anchor base, an adjustable roll support was installed near each end of the header

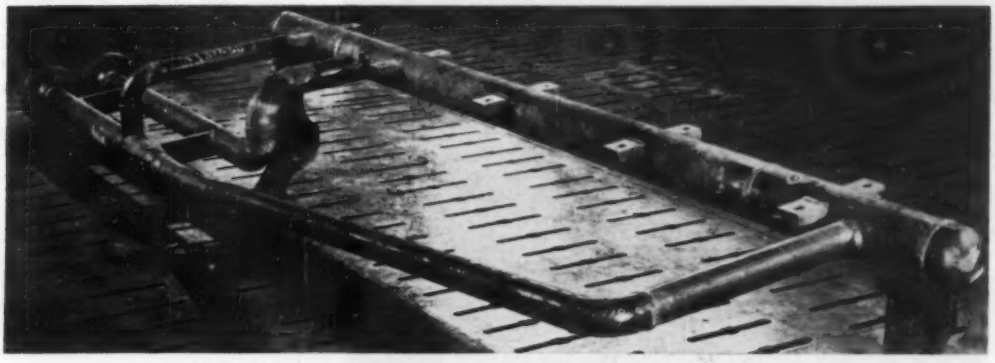


FIG. 14—HIGH PRESSURE SPRAY manifold fabricated from 3, 4 and 6 in. schedule 160 pipe for descaling operation in a steel mill. Five pairs of 1½ in. thick steel plate lugs are welded to the 6 in. section for integral supports, simplifying installation

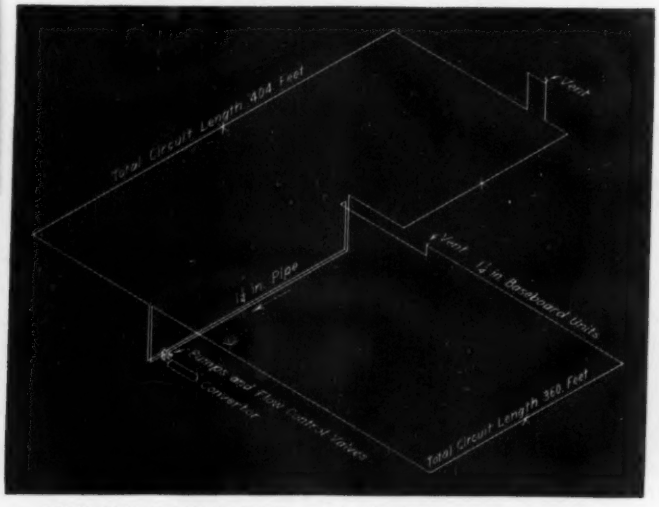
How To Use Continuous Circuit Baseboard Heating System

By Roger A. Parsons, Heating Engineer
Board of Water and Electric Light Commissioners
Lansing, Mich.

Although the idea of combining baseboard heating units and the distribution piping into a single circuit is not new, it hasn't often been applied to circuits of the length used on the installation described here. The author — who designed the job — explains advantages of the method, possibilities, and limitations

AN ARRANGEMENT which combines the baseboard heating units and the distribution piping into a single circuit is used to heat the office space taken over last year by the western department of the Boston and Old Colony Insurance Co. in Lansing, Mich. The system consists of a steam convertor maintaining a supply of hot water to be circulated through the two independently controlled zones. Steam is supplied from the street mains of the local district heating system.

With this scheme of combining the baseboard units and the piping into a continuous circuit, the ratio of the proportion of the system outside the actual heating units to the capacity of the heating units is a minimum, there being only a single supply and return riser and a single air vent for each circuit. Elimination of any other resistance to flow permits standard type circulating pumps to serve the extremely long circuits with slightly less than the usual 20 deg temperature drop.



BASEBOARD HEATING UNITS and the distribution piping are combined into a continuous circuit. Expansion joints are marked "X"

Another advantage of the method is that the entire distribution system is concealed as a baseboard and yet it is completely accessible.

There are no appreciable variations in temperature throughout the offices, and the floor to ceiling temperature differential is low. The heating unit capacity is practically the same for each linear foot of outside wall, so alteration of partitions perpendicular to the wall will not change the proportion of heating capacity to wall exposure or necessitate any change in the heating system.

Precautions To Be Observed

As with most types of heating systems, the continuous baseboard type of forced hot water system should not be used indiscriminately for all types of buildings. The following limitations should be observed for satisfactory application:

1) The design heat loss rate of the space to be heated should not ex-

ceed the total baseboard heating capacity which may be installed conveniently along exposed walls and permanent interior partitions.

2) The finned pipe element of the baseboard unit should be installed with adequate provision for expansion without noise or excessive stress. For extensive systems, expansion joints should be used, as should a type of hanger or support which also serves as a roller and a guide.

3) The usual design considerations applying to forced hot water systems should of course be included. The heating unit capacity in each circuit should be limited to the pump capacity and a nominal temperature drop. The zones should be divided so as to correspond with variations in exposure, construction, occupancy, etc. The circuits should be arranged in such a way as to minimize the number of offsets under doorways.

4) The method should not be used where complete individual room control of heat output may be necessary in addition to zoning. Individual control of most of the convection output of the heating units can be obtained by use of dampers, but complete control of the entire heat output cannot be obtained in this way.

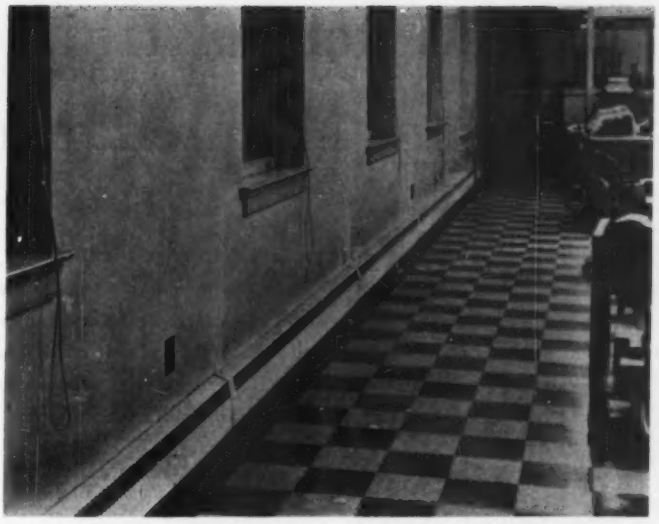
5) If unusually lengthy circuits involve a temperature drop in excess of the usual, or if continuous finned piping provides more than the required output, the capacity may be balanced with the design loss of the space to be heated by using standard instead of finned pipe in portions of the system, because all of the piping will be concealed by the cover.

Has Many Possibilities

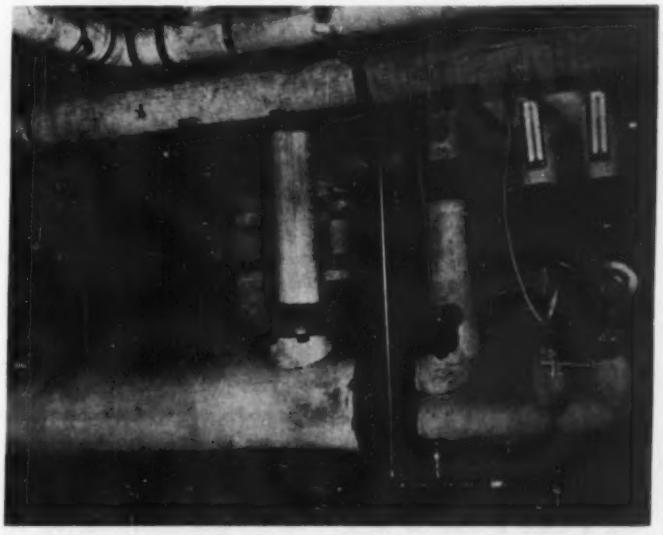
A continuous baseboard system probably could be applied to any size or type building within the above limitations. In multi-story buildings, a single central circulating riser could be used to serve all of the individual zones. For poorly insulated buildings a double row of finned pipe might be arranged beneath a suitable cover, thus increasing the output per linear foot.

The system might be adapted to use with steam instead of hot water if the appropriate installation precautions are observed. The heating element should have slight but uniform grade in the direction of flow, with no pockets or lifts. The length of each circuit should not exceed the capacity of the element pipe with the available pressure drop; the maximum length probably should be determined by the total grade allowable in retaining concealment by the cover. The usual provisions for uniform distribution of steam, such as rapid removal of air and condensate, should be observed.

The method should be applicable to a number of types of buildings having design heat loss rates within the baseboard heating capacity which may be installed conveniently. Perhaps, considering the construction and insulating materials available today, it would be just as appropriate to say that most buildings should have a design heat loss rate which would permit use of a continuous baseboard type of heating system.



ENTIRE DISTRIBUTION SYSTEM is concealed by the baseboard and yet is completely accessible. Temperature variations are low in the offices



STEAM CONVERTOR furnishes hot water which is circulated by pumps through the two separate zones. Steam comes from street mains

Helpful Hints on Plant Maintenance Work

The importance of plant maintenance, setting up a budget, how to organize to do the work efficiently, how various maintenance operations can be simplified, and many other phases of the subject were discussed at a recent conference. Here are excerpts from several of the papers of particular interest in connection with heating, piping and air conditioning.

PLANT MAINTENANCE was given a thorough going-over from many aspects in an extensive series of papers presented earlier this year at the Plant Maintenance Conference held in conjunction with the Plant Maintenance Show in Cleveland. Excerpts of particular interest to HPAC's readers from several of the papers are published here.

Initial Inspection and Future Check-Ups

"On receipt of purchased new equipment on the job, it is checked for damage which may have occurred in transit, such as broken castings, weather damage, and dirt in the working parts. Then it is checked against the specifications to see if the proper materials have been used in the construction and that the dimensions check with the drawings. Also, a check is made to locate any mechanical or physical defect. If any of the above conditions should exist, the receiving department and the engineer in charge of the project are notified and the necessary corrective steps are taken.

"It has been found, if this procedure is followed, that the cost of placing the equipment in service may be greatly reduced. As an example, a couple of years ago, we placed some air conditioners in service which, due to pressure to meet a tight construction schedule, were not checked for leaks. After they were connected, it was found they leaked; it was necesary to remove the insulation and partially dismantle the air conditioners to repair the trouble.

"We have approximately 2000 direct current and 8000 alternating current motors in operation in our plant. This excludes all motors ¼ hp or less. Over 90 percent of these motors are listed on lubrication schedules. This inspection is made weekly on some motors and with greater frequency on others. Some of our conditioning pump motors are checked three times a day. While this may seem unusual, we have set up this frequency because the service man is required, on each shift, to check conditioned air temperatures and relative humidity in the same area that the pumps and motors are located. We have found that it is good insurance at little extra cost. On several occasions, we have detected trouble, in advance, that might have resulted in serious production loss. In 1949, out of the 10,000 motors in operation, we had only 91 motor failures that required rewinding.

"Electrostatic air filters are checked each week for ground outs or flashovers and broken ionization wires. Filters are cleaned and oil is filtered on an average of three to six months, depending on operating conditions.

"Large ventilating fans are inspected once a day. During this inspection, particular attention is given that all bearings have the proper amount of lubrication, oil rings are free and rotating, fan is rotating smoothly without knocking or excessive vibration, belts have the proper tension, and bearing housings are free from dirt and grit. Once each year, these units are overhauled, cleaned, and the oil changed.

"Conditioner units are taken care of in much the same way as ventilating fans; except, twice a year, there is a general cleanup of the conditioner units where the sumps are drained. They are cleaned and inspected and the fans thoroughly cleaned and checked for balance.

"Conditioner pumps are inspected daily; oil is added if necessary, bearings inspected, packing checked for leakage, and couplings inspected for any undue wear or misalignment. These units are also overhauled twice a year when they are cleaned, regreased and repacked.

"Condensate pumps are inspected three times a week. This consists of inspection of bearings, check of oil level, oil rings and pump packing. During these inspections, the pumps and pump pits are cleaned if necessary.

"In general, we do not make a periodic inspection of all steam traps

due to the large number involved. We have, at the present time, over 12,000 traps in service. However, all traps on preheaters and air conditioners are checked once a year. During this checkup, the traps are cleaned and all worn parts are replaced. A careful check is made of all key trap installations to insure that they will not freeze or fail for other reasons. This applies only to those traps where a failure could be serious in the loss of equipment, product, or down time.

"We are considering the purchase, at this time, of three scooters to enable the trap repairmen to scoot about the plant at a faster pace.

"All relief valves on pressure vessels and hot water heaters are tested four times a year. This test consists of removing the valve, cleaning and testing it to insure proper operation at the desired pressure.

"Pressure vessels are given a hydrostatic test once a year. The test is made at 1½ times the setting of the relief valve except in the case of glass-lined vessels where it is 10 percent above the operating pressure.

"Special fire protection equipment is inspected every three months. The inspection consists of testing the heat-actuating devices, tubing and connectors for leaks, correct functioning of the motive unit that operates the quick opening valve, and cleaning the valve of sediment or foreign material."—B. M. WERLY and J. E. GRAMLICH, Eastman Kodak Co.

Record Each Item of Equipment

"The small plant has the same need for a record of its physical assets as the large plant. Elaborate as the record can be for the large plant, it must contain the basic information for the small plant. A large plant with 25 milling machines, for example, can well afford to keep records in sufficient detail to show what make holds up better, and where, and how, for replacement consideration. The small plant with a couple of millers must at least know the total maintenance cost on each as it accumulates year by year in order to know when a replacement will pay off by a reduction in the actual expenses to repair, the bother of minor repairs and the trouble of major shutdowns.

"The equipment record of each integral piece of equipment should include this information: (1) Its complete identification. (2) A list of drawings and bulletins pertaining to its operation and maintenance. (3) Its location in the plant. (4) Its service requirements for efficient operation. (5) Its maintenance requirements. (6) The length of service or hours of operation when it should be overhauled. (7) The record of actual maintenance work, with the reason for each repair given in detail."—W. C. ZINCK, Arbogast & Bastian, Inc.

Consistent Accounting for Maintenance Budgeting

"Our method of budgeting maintenance was developed in the plants of our company and has been used for several years in those plants. From studies of our own records and of data supplied by a number of other representative companies, I believe that this method can be applied to most chemical plants which have a consistent cost accounting policy and which keep adequate records.

"By a consistent policy, I mean that there must be a reasonably clear-cut distinction between the kind of expenditures that are to be capitalized and those that are to be charged to expense; that is, to maintenance. Our own policy is to capitalize not only new installations but also those expenditures that definitely extend the life of an existing asset beyond what would be obtained by normal repair. For example, patching a roof is considered maintenance; replacing an old roof by a new one is capitalized. The more consistently you follow a policy that differentiates clearly between capital and expense, the more accurately can you budget maintenance."—D. E. PIERCE, General Aniline & Film Corp.

Misapplications of Motors Cost Money

"Every once in a while we encounter misapplications of equipment—but usually after they have cost us money. The following examples may be of interest.

"A synchronous motor was installed to drive a fan. A short while after it was in service, there was a failure of the stator coils. The investigator thought that some object had gotten between the short circuiting ring of the rotor and the coils, gouging them and finally shorting the turns. On a subsequent inspection, after repair, slight rubs were noticed on the coils in line with the short circuiting ring. When the motor was observed starting up it was apparent that the rings actually touched the coils. It was our conclusion that this resulted from heating of the squirrel cage winding along the rings, allowing it to expand and to touch the coils. It was evident that this squirrel cage winding was not heavy enough to handle the starting load. An induction motor replaced the synchronous motor.

"An open type squirrel cage induction motor in the sulphuric acid department of a chemical plant developed the habit of burning out about every six months. Sealing the winding with compounds did not eliminate the failures. The solution to the problem was a totally enclosed motor.

"A similar situation resulted when an open type motor was used to drive a sulphur conveyor. It appeared that the sulphur got into the windings and enough heat was generated to make the sulphur flow. When the sulphur cooled and expanded it caused cracking of the coil insulation where the coils entered the slots. A semi-enclosed frame eliminated the trouble.

"We were having regular burnouts of motors driving phosphate mills. The phosphate became heavily deposited on the winding so that proper heat radiation was not permitted. Although the motors were blown out once a week it was not possible to remove all of the accumulations. Enclosed frames were the answer."—R. E. VALENTINE, Ocean Accident and Guarantee Corp., Ltd.

Return Line Corrosion a Problem

"So successful are internal treatment facilities and services to-

"AIM YOUR SIGHTS at upkeep, and major repairs will rarely cause you sleepless nights."

day that it is possible to operate boilers for long periods of time without any worries over corrosion and scale deposition. External softeners were therefore not provided in many plants where they should have been included because of the efficient and effective internal treatment programs in use. Once again the pendulum of change has swung too far in many cases, for new troubles have appeared in the plants.

"The new troubles are not in the boiler. They are not usually in the steam plant at all, or even in the steam distribution system. They show up as condensate return line corrosion troubles, and are responsible for expensive and troublesome leaks in the return line system. The offending item is carbon dioxide in the steam, and the source is carbonate and bicarbonate salts in the make-up water. Under boiler operating conditions of pressure and temperature, carbonates break down with release of CO_2 as an end product. The CO_2 passes out with the steam and combines in the return system with the condensate to form carbonic acid. This carbonic acid is a potent impurity and causes corrosion and erosion of metal and eventual leakage. The leakage appears first at threaded joints where the metal is thin and highly stressed in the threading and pipe fitting operation.

"The most effective solution to this problem is to provide external softening of the make-up water. The softener which must be used is one which will wholly or largely remove the carbonates. Lime soda softeners, demineralizers, sodium — hydrogen zeolite softeners and some others perform this function effectively. If the make-up water is made essentially carbonate free, if the heater delivers oxygen free feedwater and if inleakage of air to the return system is eliminated, then return line corrosion and excessive maintenance can be crossed off the list of problems for the maintenance engineer. It is the duty of the design engineer to investigate the plant water analysis and the make-up requirements with this factor in mind so as to have proper facilities recommended and installed."—R. F. HANSON, General Motors Corp.

How Maintenance Jobs Are Scheduled

"Every piece of equipment has an equipment record card. These cards are filed by their equipment number. They contain all pertinent manufacturer's data such as serial number, drawing number, purchase order, etc., and a plant history record such as service, frequency of preventive maintenance, inspection, changes in design, parts replaced, and total cost of labor and material for all work orders. At the foot of the card is a perpetual calendar. Colored plastic fingers indicate at a glance when the preventive maintenance work is scheduled.

"A cross index file is also maintained with a card for each day in the year. When a schedule is set up for any piece of equipment, it not only is recorded on the history card, but is also noted on cards for each schedule date.

"In this manner a clerk, working about a week ahead of the schedule, can pull a card out for any day and see all the items listed which are due on that date. In certain cases auxiliary cards are used, such as where a whole line of equipment comes down at higher frequency. These items can then be listed by line and if No. 1 line is down next week this card lists the preventive maintenance orders which are required.

"On a piping preventive maintenance job, we would expect to be told when a large line is failing to the point that it may need replacement in a year. Then we have a chance to investigate the design problems."—D. G. JAMIESON, Canadian Synthetic Rubber, Ltd.

Tagging Valves Aids Maintenance Work

"Another maintenance innovation which has been tried with considerable success and therefore adopted is the tagging system. By means of easily identifiable tags, the more routine of the standard repair work is marked prior to the shutdown. With this system it is no longer necessary to point out individual valves which must be repacked, since the men assigned to this job are aware of the fact that all tagged valves must be repacked. Upon the completion of the job the tag may be removed or the valve handle marked with a paint brush using colored paint. The use of the tags is also extended to cover all of the major repairs and it has been found that such a procedure considerably expedites the completion of the required work. It might be noted that to make such a system completely successful that all completed work should be marked in a distinctive manner."—O. F. CAMPBELL, Sinclair Refining Co.

Is Piping Part of Processing Equipment?

"Maintenance in food plants can be broken down into three parts. They are as follows: (1) Utilities. (2) Buildings and Grounds. (3) Food Processing Equipment.

"Such things as steam generators, auxiliary equipment including coal handling, etc., heating and ventilating equipment, steam mains, electrical feeders, transformers, fire protection equipment, etc., are all part of 'utilities'. You might ask the question—where do you have the breaking point between utilities and processing equipment where, for example, a steam line is concerned? Our thinking is that the main distribution header through the factory is a part of the utilities and where a branch comes off for a particular piece of equipment, that branch and all of its auxiliary valves, traps, etc., are maintained under the account of 'food processing equipment'."—H. L. DUNKER, H. J. Heinz Co.

Type of Metal Important in Maintenance

"In the making of liquors for pickle operations, various combinations of vinegar, salt and sugar are very corrosive. For example, we found perforations in a piece of 304 stainless steel tubing after 10 weeks of use in a particular pickle operation. The thing we found that was causing the most trouble was not so much the parts of the liquor line which were kept full of the liquor, but those horizontal runs where air was allowed to be entrained above the liquor line in the tubing. We call this "air line corrosion". We are giving consideration today for similar types of operations to glass pipe and rubber lined pipe.

"A few years ago we made quite an extensive study on various types of stainless steels from a standpoint of corrosion resistance on various types of liquors containing acetic acid and the following conclusions were reached:

"1) If a piece of equipment was so constructed that it could not be cleaned daily, then type 316 or 317 stainless steels were preferred over 304 stainless.

"2) If a piece of equipment could be cleaned and brushed properly every day to prevent any pitting, then type 304 stainless steels were just as resistant as the 316 and 317 containing molybdenum.

"The factory engineer and his department heads must determine the maintenance cycle or complete overhaul of the various machines. A lot depends on the speeds on which the machines operate. To use an extreme example, there would be much less maintenance on a slow reciprocating pump handling non-abrasive materials than there would be on a high speed centrifugal pump handling abrasive materials. The manufacturing operation and the machine should determine the frequency of a general overhaul. I need not tell you that it is certainly not wise until a machine breaks down to make a general overhaul. Card indexes and references should be kept on machines to determine when they were last repaired, how many hours they have operated since the last overhaul, and also how many repair parts were necessary for subsequent repairs."—H. L. DUNKER, H. J. Heinz Co.

When Should Maintenance Be Contracted?

"Jobs involving a great many thousand dollars and large pieces of equipment to be replaced vary greatly (from the standpoint of regularity) and thus pose a problem as to whether the work should be contracted to a specialist on the type of equipment involved or whether the plant forces should be sufficiently large to handle irregular work. Typical types of jobs which would fall into such a category are large ventilating fans handling up to 500,000 cfm of air; rebuilding of spinning machines; replacement of piping in a complete acid system; replacement of ventilating ducts, etc. There are other examples, many of which are maintenance problems of first magnitude, and many of the materials are prone to attack by corrosive fumes, in view of their exposure to the process. Some of these items are peculiar to the rayon industry, whereas others are common to the chemical industry as a whole. Some types of work are thus peculiarly adaptable to specially trained forces which generally are not available in industry, thus almost making it essential to train and maintain plant forces to do the work. The jobs which are more generally related to the chemical industry, naturally, are more adaptable to being handled by contractors with experience in the chemical field. It is then essential from an economical standpoint, considering these problems, to maintain uniform size work forces, and this is only possible by the continuance of backlogs of approved work. This work must be of such a nature that it is possible to defer portions of it in relation to its essentiality to plant operations and plant profitability, thus permitting jobs of first importance to come first, and jobs of essential nature but of lesser importance to be scheduled as the level or uniform work force becomes available on completion of the top priority work.

"Another type of problem which we have spent a great deal of time analyzing and studying is the number of mechanics or other engineering workmen per supervisor. Logically, where maintenance work can be concentrated in one shop, it is practical to supervise a large number of men with one foreman. However, the other extreme involves a trade function, such as pipefitting, of a very general nature, which means that men are scattered all over plant areas and in which assistant foremen are essential. One very effective way of stretching supervision in reference to small maintenance jobs of a day or less in duration, is the use of a shop clerk to assign jobs which have previously been prepared in an assignment form to be distributed to engineers as they return to their shop after the completion of a job. This permits the foreman to work all over the plant where his men are scattered and not tend to be confined to a shop, thus tending to make one foreman supervise, economically, a larger group of men. A good method, in my opinion, of determining the number of workmen to a supervisor is through work measurement. Work measurement quickly tends to show up losses of time due to lack of supervision. On the other hand, it will not serve to indicate clearly an excess of supervision."—J. A. CUSHMAN, JR., American Viscose Corp.

Oxygen Piping Systems an Important Hospital Service

Central oxygen systems, whereby oxygen is piped throughout a hospital from a manifold of cylinders or a bulk supply outside, have a number of advantages. This article summarizes the various methods used, explains the piping design

A PIPING application that appears to be developing is the installation of central oxygen systems in hospitals. There are only about 250 hospitals in the U. S. and Canada that are piped for oxygen and some of these have but partial systems, as for a nursery or operating room. Thus, there is a large potential for hospital oxygen piping systems.

Central piping systems should supply oxygen to all parts of the hospital, including premature nurseries, suspect nurseries for babies thought to be sick, pediatric wards, operating rooms, post-operative recovery rooms, laboratory areas where possible, basal metabolism rooms, patients' rooms and wards.

Oxygen piping systems have a good psychological effect. When the nurse brings in a mask or tent and attaches it to a wall outlet, people think it quite a commonplace occurrence because everything is ready for it. But when a large cylinder is wheeled into the room, both patient and relatives feel there has been a turn for the worse, requiring special, emergency equipment.

The psychological effect is improved if oxygen masks are available at the nurses' station on each floor. When the doctor asks the nurse to bring in a mask and she is gone but an instant, the patient sees that the equipment is used so frequently it is always kept handy.

Several Central Supply Methods

There has been little change in the design of oxygen systems since the first ones were installed. General procedure in locating the central oxygen supply, the piping system layout, and recommendations for station outlets may be summarized as follows.

Small to medium size hospitals usually have a manifold of cylinders for their central supply of oxygen, located near the service entrance and on the same floor level. The manifold is installed in a room large enough to accommodate twice the number of cylinders used on the manifold, with space enough for the attendant to change cylinders. (An oxygen cylinder occupies less than 1 sq ft of floor space.)

The manifold room is well ventilated and provided with a door that can be locked. It is not used for the storage of any flammable material. Radiators and steam pipes are located out of the way of oxygen cylinders.

Larger hospitals use bulk oxygen supply, as oxygen costs much less when bought in large quantities. Bulk oxygen is furnished to hospitals in various types of containers. In one method, oxygen cylinders are bound together and fastened on skids, which are loaded and unloaded from trucks with a crane. Another method is to secure oxygen cylinders to a trailer-truck, the trailer with its cylinders being left at the hospital. There is also an oxygen storage unit that consists of a number of permanently installed holders, which may be standard cylinders or long tubes. Another method involves an insulated sphere holding liquid oxygen under low pressure.

The oxygen storage equipment is loaned to the hospital, and is serviced by the oxygen supplier. The oxygen is delivered by special trucks as required.

Distribution Piping in the Hospital

The oxygen flows from the central supply through a system of pipe lines to the points in the hospital where it is required. The main pipe line from the central oxygen supply is usually suspended from the basement ceiling. A 1 in. main will serve up to 300 outlets, and 2 in. is believed to be the largest installed to date.

The pipes leading to the various floors are usually installed in existing pipe shafts. These risers are almost without exception ¾ in. Instead of going to a larger size, another riser is installed in another section of the hospital.

Branch lines leading to wards or wings of the hospital are run within or along corridor walls or ceilings. Individual outlet pipe lines are usually run down from the ceiling branch lines to the outlet level or up from the floor branch lines, which ever is more practical. These branches and drops are ½ in.

In most installations, the piping is concealed within the walls, ceilings and floors. Exposed piping is installed to blend with the architectural and color plan of the building.

Section shutoff valves are provided for each riser, branch line, and for special locations such as operating rooms. This makes it possible to shut off any section of the system for repair or extension.

Plan System for Future Needs

When planning an oxygen piping system, it is important to base it not only on the hospital's present need but on future needs as well. The initial piping network should serve all of the present points of use in the hospital and also be flexible enough for extension to other points with minimum expense and labor. New additions to hospitals are often piped for oxygen, while cylinders are still used in the original building. The convenience of the piping system is usually so apparent that it is soon desired to have the rest of the hospital so equipped.

A survey of the hospital reveals the most practical locations for oxygen station outlets, which can be exposed on the wall or enclosed in a metal box with a hinged cover. Two outlet valves can be installed on a single drop in order to administer oxygen simultaneously to patients in adjacent beds.

Frequently, one outlet in installed in each two-bed room, two outlets in each four-bed room, and one outlet for each three or four beds in wards. Experience indicates that each incubator in the premature nursery should have its own outlet. There should be additional outlets in the other nurseries, including the isolation or suspect nurseries. Each bed in the post-operative recovery room should have its oxygen outlet.

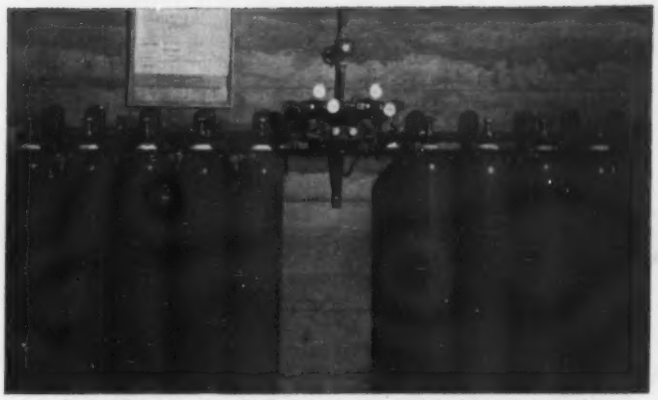
Pipe used for oxygen is seamless copper tubing, for assembly with solder type fittings. For exposed locations, it is hard temper and for concealed locations soft temper.

Fittings are wrought or cast copper made especially for solder connection. Brazing alloy used in assembling joints is silver solder or similar, with a high melting point. Dry borax or borax mixed with water may be used for flux; however, borax and alcohol mixtures must not be used.

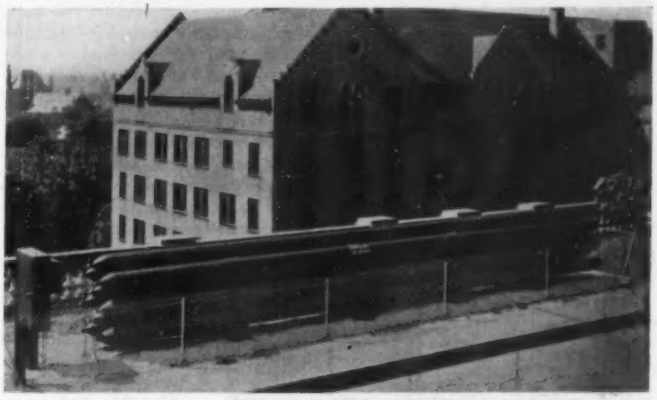
Section shutoff valves are of the brass or bronze globe type with regrinding and/or renewable metal seat and discs suitable for at least 200 psi cold, non-shock, gas working pressure.

All pressure gages are made expressly for oxygen service, including the gages used temporarily for testing purposes.

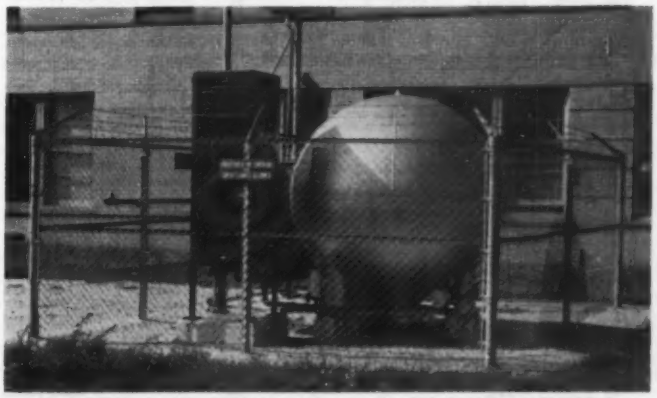
Pressure relief valves are of brass



MANIFOLD OF CYLINDERS for central supply of oxygen is used in small to medium size hospitals. Manifold is installed in room large enough for twice the number of cylinders used, and with space for changing cylinders



BULK OXYGEN SUPPLY is used when consumption warrants it, as it costs much less when bought in large quantities. One form of storage unit comprises a permanently installed holder such as that shown here



INSULATED SPHERE holding liquid oxygen at low pressure is another method for bulk supply of oxygen for hospitals. Such systems are serviced by the oxygen supplier, oxygen being delivered in special trucks

or bronze with metal disc, supplied by the manufacturer especially washed for oxygen service and adjusted to relieve at a pressure 50 percent above the normal line working pressure.

Each section shutoff valve is identified with a suitable sign or metal tag attached to it or placed in the immediate vicinity. Signs for valves in risers serving operating rooms read "Oxygen for Surgery — Do Not Close."

Tubing, Valves, Fittings Must Be Clean

Before erection, all tubing, valves and fittings — except those manufactured for use in oxygen service and supplied especially washed — are thoroughly cleaned of oil, grease and other combustible materials. This is essential, because oil and grease in contact with oxygen under pressure may ignite. The contractor can build a trough to do the job, although he can buy the equipment cleaned by the supplier. It is necessary to have a continuous supply of hot water to the trough to keep the solution hot, and it must be agitated, for which a wooden paddle can be used.

To wash the components of the oxygen piping system, a hot solution of sodium carbonate or trisodium phosphate in the proportion of 1 lb to 3 gal of water is used. Scrubbing is employed where necessary to insure complete cleaning. After washing, all materials are rinsed thoroughly with clean water.

After cleaning, particular care must be exercised in the storage and handling of all tube and fittings. Tools used for cutting and reaming must be clean to prevent contamination by oil or grease. If such contamination occurs, the items must be rewashed.

Joints in the tubing, except those at valves or equipment requiring screw connections, are made with solder type fittings. Particular care is taken in applying flux to avoid leaving any excess inside the completed joint. The outside of the tube and fittings must be cleaned by washing with hot water after assembly.

Wherever possible, screw joints used in attaching valves or other permanently connected equipment are silver brazed after assembly. Care must be used to avoid overheating the valve or equipment. Where conditions do not permit brazing, the connection joints can be made by tinning the male thread only.

All pipe bends with a radius less than five times the outside tube diameter are made with solder fittings, or the tubing is shaped with bending tools. All bends must be free of appreciable flattening, buckling or thinning of the tube wall.

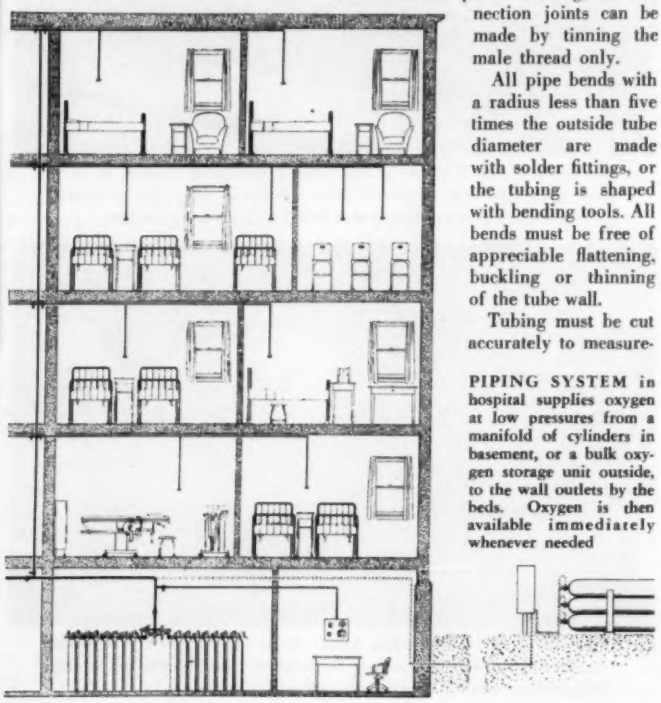
Tubing must be cut accurately to measurements taken at the place of installation, and then worked into place without springing or forcing.

Tubing in the building should be adequately supported at not less than 10 ft centers by means of suitable clamps or hangers. Underground tubing should be in trenches deep enough to avoid damage from pressure or vibration caused by surface traffic. The bottom of the trench should be in firm soil, graded to provide continuous support to the tube.

Underground tubing laid in cinder fill or in soil of acid character should be surrounded with a 3 in. layer of well slaked lime. Tubing embedded in concrete should be wrapped with tar paper or heavily coated with asphalt or pitch to allow freedom of movement during expansion and contraction.

All exposed tubing can be identified by painting it a distinguishing color such as olive green, or by applying color bands.

Valves should be installed in accessible locations and independently supported in a manner that will prevent their operation from placing strains on the tubing or joints. Valve boxes or recesses must be large enough to provide adequate space for operation and maintenance. Outlet valves should be installed not less than 4 ft, 6 in. from floor level.



PIPING SYSTEM in hospital supplies oxygen at low pressures from a manifold of cylinders in basement, or a bulk oxygen storage unit outside, to the wall outlets by the beds. Oxygen is then available immediately whenever needed

Testing the Piping System

After the tubing is erected, but before outlet valves are installed, the line is blown clear by means of water-pumped compressed air which is free of oil, or with nitrogen. The outlet valves are installed and each section is tested with 150 lb pressure. Oxygen is not used because a leak might be near a workman's blow torch or some other flame. This test is maintained until it has been determined there are no leaks. Joints can be tested with soapy water.

A final 24 hr pressure test is made during which time there should be 0 lb pressure drop. Any leaks must be repaired. Oxygen is then used to flush out the air or nitrogen used to make the test and the system is placed in operation.

[*Editor's Note* — A standard on oxygen piping for hospitals to be issued by the National Fire Protection Association with the endorsement of the American Hospital Association is nearing completion and is expected to be available soon. Future installations will no doubt follow the recommendations in this standard, which vary in some details from this description of practices to date.]

In Lake Michigan, Chicago has an abundant supply source of water, but increasing usage may create serious problems in pumping, distribution, and disposal of used water

Limit Use of Water for Air Conditioning?

Differing Views Expressed at Recent Conference in Chicago . . . . . Official Statement of Contractors' Group Says No Need for Regulation at Present Time

DOES CHICAGO need legislation limiting the use of water for air conditioning systems? City officials say yes — in the not-too-distant future. Contractors say not yet — and why pick on us? Because of differing opinions, this was the subject of a panel discussion during a recent conference on boilers, unfired pressure vessels and their safety appurtenances, sponsored by the boiler and refrigeration department of the city of Chicago in cooperation with the Chicago Boiler Manufacturers Association and the insurance companies which insure boilers and machinery in the Chicago area.

Chicago's Water Is Cheap

Background information on Chicago's water system was supplied by Assistant City Engineer Loran D. Gayton. He pointed out that all manufacturing, industrial and commercial users, and all residences for four or more families, must have water meters, and also that all users whose bills amount to $35 per year or more must also have meters. These users pay a net rate of 8c per 1000 gal, and as of December 31, 1949, there were 120,850 metered premises paying for water. The city must, upon demand, supply water to any municipality within the limits of the Sanitary District (when that municipality brings its pipe lines to the Chicago city limits) at the same price charged to large users of water within the city limits; at the present time, Chicago supplies water to 37 such municipalities.

For quantities of water up to 10,000 cu ft per quarter, Chicago has the lowest meter rate (60c per 1000 cu ft) of the country's 12 largest cities. In general, single, double and three family residences, and any premise where the bill is less than $35 per year, do not require meters but are charged for water under the so-called frontage or assessed rate. This is a flat rate, depending upon frontage of the lot, size of the building, and number of outlets. As of December 31, 1949, there were 313,702 of these unmetered or unmeasured services.

The water supply system delivers water without charge to hospitals and to municipal, religious, educational and charitable institutions, and for parks, fire hydrants, street cleaning, and public improvement. During 1949, over $1 million worth of water was delivered free to such consumers.

At the end of 1932, there were

approximately 20,000 tons of air conditioning equipment installed in Chicago. By the end of 1941, this figure had increased to approximately 80,000 tons. As of December 31, 1950, the air conditioning equipment in the entire city had increased to 190,826 tons refrigeration. If the entire 190,826 tons of air conditioning equipment were operated at 100 percent capacity and required cooling water at the rate of 1.5 gpm per ton, the peak demand for air conditioning purposes alone would be at the rate of 412,184,160 gal per day.

City's Sewers Are Inadequate

Mr. Gayton pointed out that for over 25 years the city has recognized the inadequacy of the sewers in the central business district to handle satisfactorily the ordinary storm runoff. Now, with rapidly increasing demands for water for cooling purposes in connection with air conditioning, the inadequacy of these sewers is again brought to attention. Because of the overloading of sewers in the "loop" area, the city's sewer department has made it a practice to scrutinize plans for the installation of air conditioning equipment in loop buildings that call for sewer connections in excess of 8 in. in diameter. In some cases the installation is allowed if the building is on a line where the load can be handled, but in other instances substitute or smaller installations are recommended by the city, and a permit for the greater capacity outlet is denied.

James McKeague, of the boiler and refrigeration department, stated that the Chicago water supply is, of course, abundant but that facilities for pumping and maintaining proper pressure in all parts of the city are at times inadequate. In fact, he said, the Department of Public Works, during the past few years, has received hundreds of complaints that people could not obtain water for the bare necessities. He pointed out that any addition to the water or sewage systems is a capital expenditure requiring large and long range planning, possibly bond issues, etc., and from the standpoint of refrigeration and air conditioning, cannot be considered.

According to Mr. McKeague, there are a little over 400,000 tons of refrigeration for commercial and industrial refrigeration and air conditioning purposes now in operation in the city, almost one-half of this tonnage being for air conditioning. The records of the boiler and refrigeration department show that for the year 1948 more than twice the number of air conditioning systems were installed than in the year 1947. During the year 1949, approximately 20,000 tons of refrigeration used for air conditioning were installed. During the year 1950, 25,081 tons of refrigeration, using water for condensing purposes, were installed in the city of Chicago. Of this amount, 83 percent was for air conditioning purposes. Stating that the total installed horsepower for air conditioning in the city is 190,000, and assuming 1 hp equal to 1 ton of refrigeration and 1 gpm per ton, and 14 hr of operation per day, Mr. McKeague said the amount of water required for air conditioning would be 159,600,000 gal per day, or 11.3 percent of the total daily water consumption.

In discussing the use of water conservation equipment, the speaker stated that if air conditioning systems of 20 tons and over were provided with water conservation devices so as to use only 10 percent as much water as shell and the tube condensers, the amount of water conserved would be approximately 73,416,000 gpd.

If all refrigeration systems used for commercial and industrial purposes, at the present time employing water from the city mains for condensing purposes, were designed, installed, and provided with a water control device so that not more than 2 gpm per ton of refrigeration were used and if automatic water regulating valves or other devices were used to provide a positive shutoff of the water when units were not in operation, another 10 percent of the total amount of water pumped and distributed by the city could be saved.

In his opinion, it is evident that if this use of water is continued and refrigeration for commercial, industrial and air conditioning purposes continues to be installed at the same rate as since the year 1946, a situation will be created that will require drastic action in the not-too-distant future.

A paper giving the opinion of the air conditioning committee of the Heating, Piping and Air Conditioning Contractors Chicago Association was read by P. H. Kroeschell, of Kroeschell Engineering Co., in the absence of W. S. Bodinus, chairman. The report indicated that the Chicago contractors have been cognizant of the increased consumption of water required for air conditioning and refrigeration systems and the problem of the disposal of this water. However, the statistics on water consumption are not considered alarming and it was pointed out that the planning of the water works of the city of Chicago has not been neglected. The water system, it is believed, is of adequate capacity to take care of the requirements for refrigeration and air conditioning at the present time and for anticipated increase in the near future.

Regulation Not Needed Now

Recognizing that it is essential to plan now for adequate facilities in anticipation of the time when increased demands might seriously load Chicago's present water distribution system, the report stated that mechanical water conservation devices today are highly perfected and dependable equipment can be installed without too much concern in new buildings. Use of such equipment represents a 10 to 25 percent increase in the initial cost of the air conditioning system, and there are application problems such as the disposal of vapor laden exhaust air from the conservation device as well as the noise of the sprays and fans. The committee also pointed out that the low cost of Chicago water makes it economically unsound from an owning and operating cost standpoint to install any water conservation device except in the most unusual situations where city water connections may be difficult and costly to install.

A number of difficulties encountered in installing water conservation devices in existing buildings were cited (particularly in connection with the use of heavy cooling towers and the use of small 3 or 5 ton conditioners).

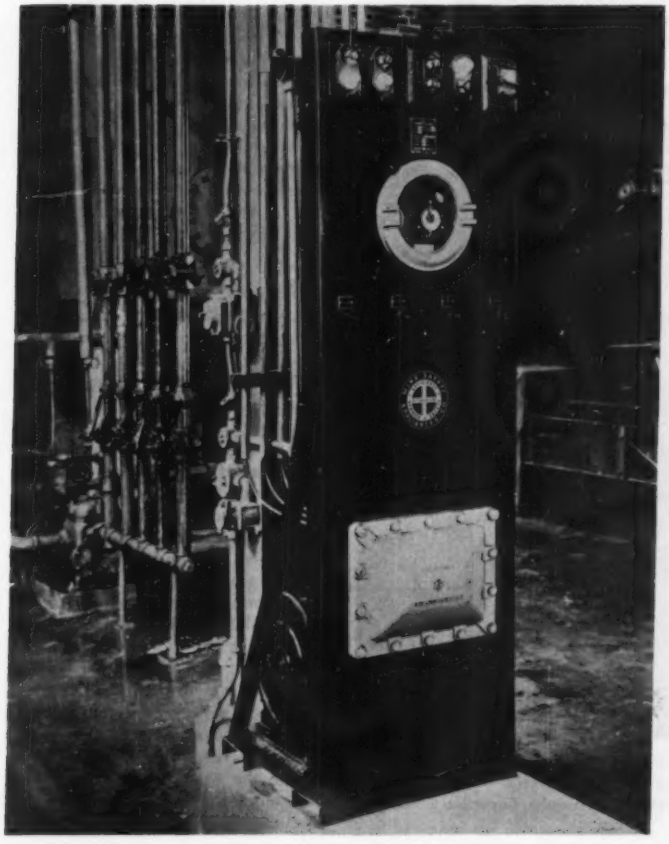
In the opinion of the contractors' association, the time has not arrived

[*Concluded on page* 101]

Combustible Gas Alarm Aids Safety in Solvent Extraction

Piping and processing equipment in industries using or producing combustible gases present safety hazards that must be provided for in the original design and installation, the operating precautions observed, and in the instruction of personnel. Among the safety features of a rendering plant is a combustible gas alarm which takes continuous samples from eight locations

COMBUSTIBLE GAS ALARM analyzes air samples taken continuously from eight locations in the solvent extraction plant. When combustible concentration is detected, warning is given by red light and an audible alarm



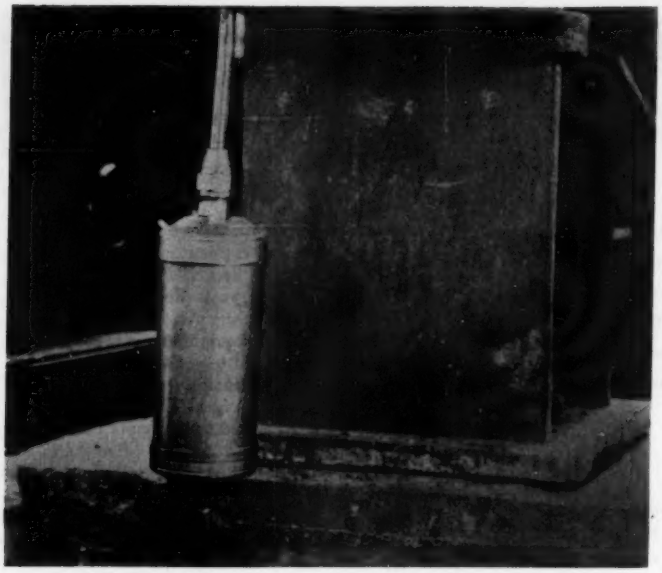
RECOGNIZING THE "high hazards" of solvent extraction, the Hunter Packing Co., East St. Louis, Ill., specified extreme precautionary measures for its rendering plant. Strictly observed safety regulations and continuous, scheduled use of scientific equipment and instruments have paid "safety record dividends" since the plant was constructed a little more than a year ago.

In addition to "personal" safety rules covering plant operations and working habits, the building itself was engineered to minimize explosion hazards. The main hazard, according to Dustin H. Griffin, assistant treasurer and superintendent of inedible byproducts production, lies in the combustibility of vapors from the solvent extraction process. One of the first safeguards deemed necessary was a reliable alarm system to warn of concentrations of vapors approaching combustible limits.

Continuous Sampling Gas Alarm Used

A multi-point continuous sampling combustible gas alarm is used. Air samples are drawn from eight different locations to the instrument, which is in a prominent spot and easy to see. A turbo-compressor vacuum pump in the unit aspirates for the air samples. In the instrument is a motor-operated multi-way sampling valve, enabling the unit alternately to analyze combustible concentrations.

Samples are passed across one of two heated platinum wires forming a balanced electrical circuit. If the test air contains combustible vapor, the flammable components are burned on contact with the hot wire, unbalancing the electrical circuit in proportion to the degree of concentration. When the balance is upset beyond a predetermined limit, a red warning light flashes on. An audible alarm signal is energized simultaneously while an annunciator light system shows the sampling line from which the air was drawn.



ONE OF THE EIGHT sampling points for the combustible gas alarm system. Vacuum pump in instrument aspirates the samples. Other applications of method include refineries, drying towers, sewage disposal plants, gasoline stations

PORTABLE EXPLOSION METER is used in plant areas for extensive testing before any repair work—including welding or brazing—is permitted. Another precaution at the plant is careful and regular inspection of important valves, switches

When an alarm is sounded, investigation is started immediately to determine the source. Another emergency alarm, either operated manually or energized by the main sprinkler system valve, is sounded in the main engineering office and the engine room, the latter being occupied at all times. This alarm is used for serious emergencies.

Operations in the plant consist of processing inedible animal material and the withdrawal of the rendered or "free" grease or tallow. The solid residue is washed several times with a volatile solvent, commercial heptane. A mixture of grease and solvent is known as miscella. After washing with solvent, vapors are driven off with steam and condensed. Two stills with individual surface condensers are used to distill the miscella. Non-condensable vapors from the stills and other vessels vent to a carbon adsorption system.

Hazards of solvent extraction are centered mainly within the possibility that combustible gases (heptane vapor) may escape and develop concentrations in excess of safe limits. Exhaust fans in the extraction room are kept in continuous operation. A large fan above settling tanks is operated during all processing. Unscreened doors are kept closed. A complete air change every six minutes is the design capacity of the ventilating system.

Careful Check Before Welding or Brazing

A small portable explosion meter, which instantly measures concentrations of gases and vapors below the explosive range and indicates the presence of concentrations within and above the limits, is provided for use before any major maintenance work — including welding or brazing — is permitted in the building. The company's safety regulations provide that all lines and vessels be drained of solvent and the supply lines to solvent storage tanks be blanked off. After the equipment has been steamed or ventilated with forced draft and all vessels and lines have been filled with water, extensive tests are to be made with the meter under the direction of the supervisor on duty and the plant fire department. A representative of the fire department stands by while the work is performed after clearance has been authorized. All welding equipment and tools are re-

moved from the building before production is resumed.

Among other safety measures which have been adopted and are enforced at the plant are restriction of entry into the extraction building to authorized personnel only; no smoking within the building or adjacent areas (personnel are not permitted to take matches, lighters or smoking material into the building); wearing of approved shoes by personnel with unrestricted access to the extraction building; and inspection of shoes of other persons entering the area.

Important valves and switches are carefully and regularly inspected, sealed and tagged. Charging domes of the cookers are inspected and sealed by the foreman or supervisor in charge.

Throughout the plant, non-sparking tools are used and all electrical equipment, including lighting fixtures, is of the explosionproof type. Even flashlights are explosionproof.

Emphasis is placed on plant housekeeping. The premises are kept orderly, clean and dust-free. Leaks and spillages are given immediate attention. The plant fire department inspects the building, its sprinkler system, standpipes and hose lines and extinguishers at frequent intervals.

Education of workmen is another phase of the safety program. Safety meetings are conducted and operating personnel are trained in the use of fire fighting equipment. Warning signs are prominently displayed.

Unloading Tank Cars and Trucks

Solvent tank cars and trucks are unloaded under the direction of a foreman or supervisor while a representative of the fire department stands by with extinguishers during the entire operation. Tank cars are grounded by special clamps and cables provided for the purpose and the cars are checked for such items as tank pressures, leaking valves, etc., that would add to the hazard of unloading.

Precautionary measures taken through the enforcement of safety regulations and use of approved safety equipment have helped Hunter attain its objectives of economical solvent extraction with a maximum recovery of tallow, grease and solids under optimum conditions of safety and sanitation. [Photos courtesy Mine Safety Appliances Co.]

LIMIT WATER? —

[*Concluded from page 98*]

when the use of water conservation devices should be mandatory in Chicago. The statistics indicate that air conditioning and refrigeration installations consume but a small portion of the Chicago water supply and the period of peak consumption for this service does not occur at a time when water is in most demand for domestic use. It is the opinion, however, of the committee that steps can be taken to stop the possibility of uneconomic waste of water on both existing and new buildings, which in itself will save as much as 25 percent of the total water used for this purpose.

The association considers that every effort should be directed toward the use of water conservation devices on new buildings where they can be planned for in the building structure and architecture. For installations made in existing buildings, the quantity of water per ton of refrigeration should be established at a "reasonable maximum instead of the unlimited usage condition which is now possible". Positive shutoff devices should be installed to stop the flow of water when the machine is not operating.

The sewage disposal system of Chicago presents a problem which — in the opinion of the committee — is in some instances a more critical one than is the water supply. Since only certain sections of the city are critical, it is the responsibility of the air conditioning engineer to check on this. It is obviously foolish to use city water in locations where a disposal problem already exists.

The report also pointed out that it is reasonable to assume that the sewage disposal system will be improved more rapidly than the additional usage imposed upon it by air conditioning equipment. The disposal of rain water is now a critical problem even in remote residential areas, and when this is corrected, it is assumed that industrial and commercial waste water, such as condenser water, will be provided for in the installation of storm sewers or by enlarging the present system.

Other Users Waste Water

In his discussion of the problem, S. R. Thompson, Thompson Refrigeration Service, cited many practices in connection with other uses of city water. In speaking of wastage, he mentioned that leases are made with commercial landlords furnishing the water and with no effort being made on their part to stop wastage — certainly none on the part of the tenants. Other uses mentioned included subcooling in many industrial applications, industrial washing and rinsing, direct cooling and heating, and carrying sewage or solids in some manufacturing processes. In regard to the cost aspect, he said that Chicago's water is so cheap that automatic regulators on all types of equipment are neglected, and it is actually cheaper not to repair than to waste water. Water today in Chicago is only 27 percent metered, and though the city needs tax revenue, some of the suburbs using Chicago water charge much higher rates.

In terms of maximum pumpage, Mr. Thompson said that refrigeration and air conditioning equipment in Chicago uses only 26 percent of the maximum pumping capacity, and that while there is wastage of water, there is no guarantee that restrictions on the 26 percent will give freedom from water troubles.

Stating that there has been a good deal of wastage, and citing a number of stringent restrictions in other cities, James Hummer, of Murphy & Miller Inc., said that the contractors must cooperate actively with the city in order that the refrigeration and air conditioning industry does not become burdened with discriminatory restrictions.

DEVELOPER OF V-BELT DRIVE DIES

WALTER GEIST, president of the Allis-Chalmers Mfg. Co. since May 1942, died suddenly January 29.

In his first job at Allis-Chalmers, Mr. Geist served as a messenger boy in the blueprint department. Within a short time, he entered the milling department as a tracer, and held the posts of draftsman and engineer before being named assistant manager in 1928.

It was while he was an engineer in charge of transmission in the milling department that he developed the multiple V-belt "Texrope" drive.

SECOND FLOOR, comprising two apartments, was added to the existing building, an air conditioned drive-in eating place. Finding space for the equipment and the ducts was a problem

Adding Floor Presents a Problem

Willard B. Buck, of Austin Heating & Sheet Metal, Austin, Minn., Explains How the Problem of Heating and Air Conditioning a Floor Added to an Existing Building Was Solved With a Little Ingenuity

THE JOB OF air conditioning an extra floor added to an existing building is one that frequently must be done, but I doubt that—as a general rule—it includes all the complications I encountered recently on a small building.

The problem, as briefly as I can outline it, was as follows. The existing one story brick and tile building, with nearly 75 percent of the outside walls broken up with doors and glass and practically no interior partitions, is a completely year 'round air conditioned deluxe drive-in eating place.

The entire front 80 percent of the building has no interior walls whatsoever. The back of this area has a stub partition wall containing the exhaust from the griddle and a majority of the existing plumbing pipes; electrical conduit for the lights, refrigerators, waffle irons and other appliances; and conditioning ducts for the first floor. The main sink and dishwasher occupy one side of this wall and the steam table, griddle and refrigerator the other. There is a small private office for the manager in one corner of the rear of the building and a washroom in the other; the basement stairway separates them and cuts out one corner of the office. The floor is a poured concrete slab with tile finish and the roof was steel bar joists with a 2 in. poured vermiculite insulation and a built up roof.

The existing conditioning equipment included a gas fired forced air furnace and a very much oversized cooling coil with a remote 5 ton radial condensing unit. All the outlets were ceiling diffusers or high wall air conditioning registers.

Practically No Available Space

Because of the limited floor area available, the owner was very concerned about equipment space, and could not afford to give up equipment space on the new second floor, which comprises two complete apartments. The basement contains, in addition to the conditioning equipment, a complete bakery, two hot water heaters, and a food storage area, but there was a small area available for equipment. Because of the small floor area available, it was necessary to build onto the building enough to provide two separate stairways for access to the second floor and in so doing, almost all the remaining outside wall space was used up.

How the Ducts Were Installed

I debated for some time regarding this problem and evolved the following solution, as individual runs were impossible. There was a small space in the corner of the office adjacent to the chimney which was useless to the owner and which could be used for ducts. He consented to giving us a few inches on the face of the chimney in the office and a corner on the opposite side of the chimney next to the staircase. By utilizing supply and outdoor air duct velocities of 1800 fpm, I could thus get the necessary air down to the basement and up to the second floor, and had only second floor distribution problems to contend with.

As the existing first floor ceiling joists already contained the supply ducts for the first floor ceiling diffusers and lighting fixtures, and the cost of breaking all the insulation out was prohibitive, the area between the first floor ceiling and the new concrete slab, which was poured over the insulation, appeared lost as far as second floor distribution was concerned. The only space which appeared to remain was the ceiling joists and the cost of squeezing a complete supply and return system into this space seemed prohibitive.

As the job is now installed, the two second floor supply ducts, which are sized according to standard prac-

tice, feed down the hall ceiling from the risers. The hall ceiling was dropped 10 in. to accommodate the ductwork, and air conditioning diffusion type registers with volume type dampers were installed to permit balancing the job. There are only three ducts which take off from the hall trunk and run across in the bar joist space between the second floor ceiling and the steel deck of the roof. These runs are insulated, as are the outdoor air duct and main risers. All the other second floor registers are direct take-offs from the hall trunks.

The return air registers are standard baseboard registers in the interior partitions of the second floor. These connect through the old insulation into the bar joist space between the two floors and this entire space acts as a return air plenum. The return air duct extends only from the ceiling of the first floor to the basement.

Each Apartment Has Thermostat

Each of the apartments has its own thermostat which actuates a zone damper in the basement. The zone damper motors actuate switches which start the fan in winter and the fan and compressor in summer.

The control system is so designed that the same thermostats operate on both the heating and cooling cycles and their operation is reversed automatically by a control in the outdoor air which permits the compressor only to operate when the thermostats are operating on the cooling cycle, and the furnace only when they are on the heating cycle.

A bonnet control on the furnace maintains a 150 F temperature whenever the heating cycle is in operation.

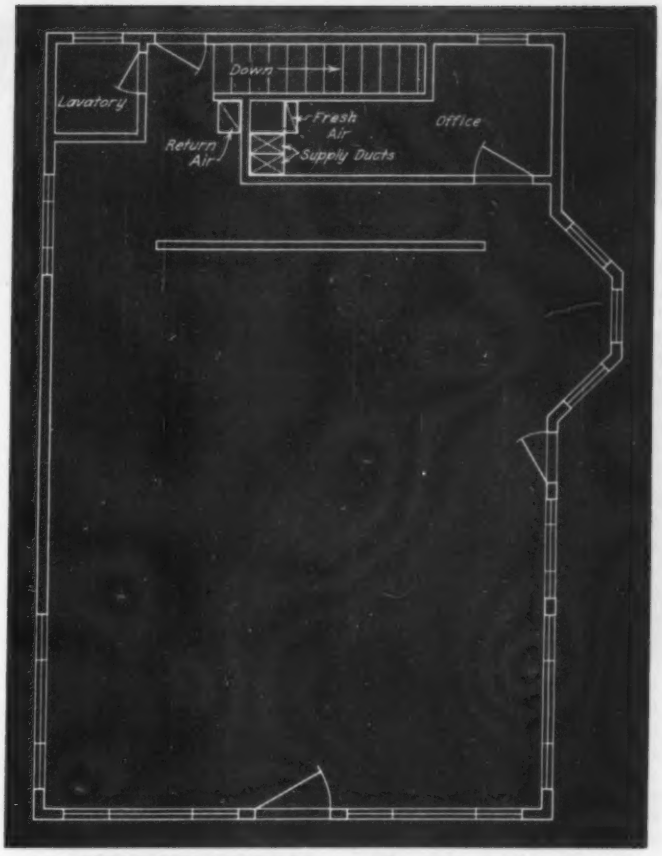
Existing Coil Split Into Two

The existing coil was an eight circuit one, operating at slightly above 53 deg. By removing the existing distributor and installing a three and a five circuit distributor, it was possible to connect the new 3 hp compressor to the top six rows of the face of the existing coil and reconnect the 5 hp machine through the five circuit distributor to the remaining 10 rows of the coil face.

This, in effect, made two coils of the existing one and allows separate control of the two floors, as a blank was inserted in the suction header, without mixing air from the commercial area on the first floor with air from the apartments. This complete separation of the two refrigeration circuits also prevents the unloading controls of the compressors from fighting one another.

The cooling coil is now operating with a face velocity of about 525 fpm at about 36 deg for each zone and doing a completely satisfactory job of conditioning the entire building, including the basement. The waste water from the compressors is piped to the roof.

All the second floor ductwork comes out adjacent to the equipment in the basement and practically all the basement ductwork, which is below the basement bar joists, is in the equipment corner over the water heater or compressors. This allows plenty of headroom in all working areas.



THE OWNER CONSENTED to use of some space adjacent to the chimney for installation of ducts to serve the new second floor. Velocities of 1800 fpm are utilized in these ducts

Installed Without Interruption

The owner, tenants and restaurant patrons seem highly pleased, and the entire job was installed without interrupting operation of the restaurant to any particular extent, as the trunk ducts through the first floor were installed while the restaurant was closed for a holiday.

The plumbing installation could not be done quite so simply, and provision for most of the piping had to be made in a special chase under the stairs to the second floor.

QUESTION of the Month

QUESTIONS ON heating, piping and air conditioning asked by HPAC's readers are answered here each month. We hope you find these practical comments of regular interest, and will contribute either a question or an answer to a published question on occasion. Address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2, Illinois.

SHIFT RADIATION TO BALANCE THE SYSTEM

THE MAINTENANCE manager of a hospital asks (in the February HPAC) for an answer to complaints about heating. The main building has two stories above a basement. It is heated by low pressure steam from an oil burning boiler in the basement and has single pipe cast iron radiators. The interior of the surgery department recently was modernized and the heat transmitters were changed—for this department only—to convectors.

There is much too great a differential between inside temperatures, says "C. H. B.," the maintenance manager. On December 21, the outdoor temperature was 24 deg and the areas having cast iron radiators were at the following temperatures: basement, 82; first story, 82; second story, 80. The surgery wing, with convectors, was at 68 deg. It appears that within minutes after the oil burner operation stops, the surgery wing convectors are cold, while the cast iron radiators stay warm for 30 minutes or so, he says.

This hospital requires something of an operation. If the cast iron radiators are only 20 years old, perhaps they have connecting nipples between the sections at their tops, and the operation might then be to change the plant over to mechanically circulated hot water. This will mean running return mains and connecting a return branch out of every radiator and every convector. The boiler and oil burner will work acceptably with water instead of steam and the temperatures will equalize nicely, though possibly the surgery wing will need additional heat transmitting surface to gain the same ratio of supply to loss as obtains in the other rooms.

If the cast iron radiators have no top connecting nipples, the operation might be to move into the surgery wing some of the best radiators, and to move some of the convectors out from the surgery wing into the rooms of the balance of the hospital so as to obtain a more stable average condition.

It is to be remembered that a cast iron radiator with water at 170 deg mean temperature will do a better heating job than will a finned convector. With a finned convector, the water temperature should be 200 deg or more. The two kinds of heat transmitters do not coordinate on the same job.—S.R.L.

DON'T USE CONVECTORS, RADIATORS ON SAME ZONE

THE MAINTENANCE manager of a hospital asked—in his question published in the February issue—for assistance on a heating problem in his building. The problem is due to the use of both cast iron direct and convector type radiation in the same system.

Whenever cast iron radiation is used with convector radiation in the same building, the combination is apt to prove unsatisfactory unless each type of radiation is installed on a separate circuit and is controlled by separate thermostats. In order to provide satisfactory heating in a large building having three or four exposures or in a building consisting of several wings, it is always advisable to have the heating system comprised of several zones. Due to the sun load, the heating load of one exposure will be less than that of the protected zone. During the late fall and early spring months, when mild weather is prevalent, zone control of a heating system is particularly desirable.

Employing heating units of copper and copper alloy, convectors respond almost instantly to any change in the temperature or pressure of the heating medium. Demands of sensitive automatic control systems are followed closely without lag or over-run in heat delivery. Cast iron radiation, of course, responds more slowly to the demands of thermostat controls and therefore cannot be operated satisfactorily on the same zone employing convectors. —A. S.

RELOCATE THERMOSTAT OR ADD CONTROLS

THE PROBLEM OF "C.H.B." published in the February issue about difficulties in heating the hospital of which he is the maintenance manager is one that is very common.

It appears that the old building is provided with cast iron radiation while the new addition is provided with convectors, and the thermostat that controls the boiler is located in the old building. Cast iron radiation, due to its mass and bulk, retains the heat after the steam has been shut off considerably longer than the light heating sections in the convectors. The result is that when the thermostat in the old build-

[*Concluded on page* 106]

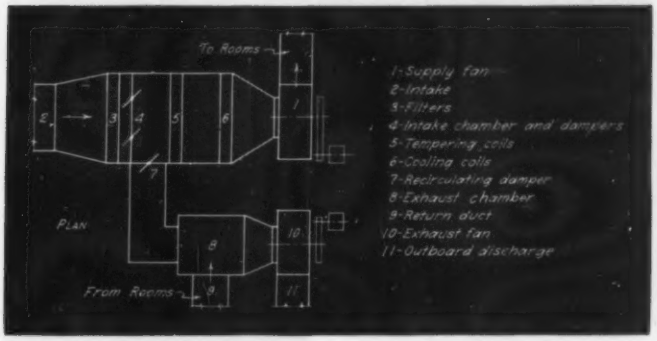
ASKS AID ON ESTIMATING PIPING COSTS

You are invited to answer the following question from a reader of HPAC. Suitable comment on the matter will be welcomed and — space permitting — will be published. Address your reply to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

"I am very much interested in information pertaining to the estimating of piping costs, and would appreciate any references to published information or any data from readers of HPAC on this subject. Comments on methods of estimating, as well as actual unit figures, would be helpful." —A.T.

Sam Lewis' Page

. . . . . practical comment on everyday problems



ITEM 6 CONCERNED difficulties in air conditioning offices of a food packing concern. The situation was corrected by closing recirculating damper 7 and connecting outlet 11 to chamber 4

INFORMAL COMMENT on heating, piping and air conditioning matters is given in this regular feature by Samuel R. Lewis, consulting mechanical engineer, and a member of HPAC's board of consulting and contributing editors. Mr. Lewis is the recipient of the 1951 F. Paul Anderson Medal, given by the American Society of Heating and Ventilating Engineers "in recognition of notable scientific achievement or outstanding services performed in the field of heating, ventilating, or air conditioning."

HOW WE CORRECTED SOME FAULTY JOBS

IN DECEMBER, when reading the galley proofs of my "Page" printed in the January HPAC, I made some sketches that I hoped would elucidate that article. The sketches were too late to do any elucidating because the magazine had room only for more important things. At least, that's the impression the editor gave me.

They are presented herewith as an apology, in the hope that if any reader thought my precepts were obscure, he may now attempt to understand them.

Item 6 of my January "Page" had to do with the general offices of a big food packing concern. The supply fan 1 (see accompanying sketch) drew air from outdoors through the filters 3, the face dampers 4, the refrigerated cooling coils, and the reheating coils. It delivered the air into the various rooms. The exhaust fan 10 pulled the spent air from the rooms through the duct 9, and was intended to waste it outdoors through duct 11.

The unfortunate designer, however, expected to conserve refrigeration cost by slowing down the exhaust fan or throttling it, partly closing dampers 4, and partly opening damper 7, so as to recirculate to supply fan 1 a part or all of the spent air coming into chamber 8 through duct 9.

The scheme worked for a while until all concerned forgot it, and for several years therafter, until, after a sad and costly series of complaints, the management sent for me.

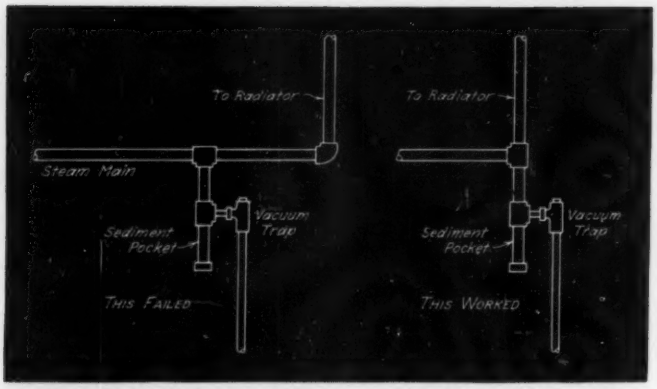
I found that exhaust fan 10 had not been slowed down or throttled and that various poor adjustments of air volumes had been made, so that exhaust fan 10 was drawing in nearly all of its 20,000 cfm capacity directly from outdoors through the unhappily open damper 7, and that it was throwing this air back outdoors through duct 11.

As a result, of course, the supply fan 1 had a hard time getting enough air to satisfy the occupants of the rooms, and the rooms, deprived of the designed service by exhaust fan 10, were too cool in winter and too hot in summer and were odorous at all times.

I corrected things with a new duct from the exhaust fan 10, installed so that any part or all of the output of this fan could be returned to the intake chamber of the supply system.

We removed duct and damper 7. As a result, exhaust fan 10 must always cooperate with and assist supply fan 1 and never again can enter into competition with it. Incidentally, as a result of this service, we were retained immediately to design a ventilating and cooling system to double the office areas of this manufacturer.

The accompanying sketch for item 9 illustrates a steam fitting kink the correction of which I paid for, due to



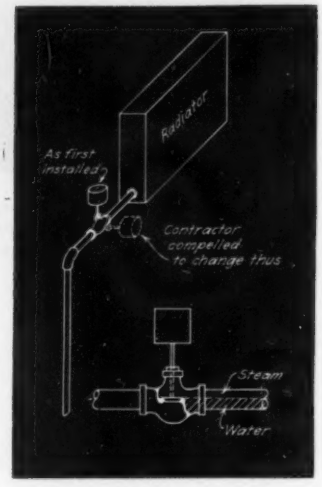
ITEM 9 DISCUSSED a steamfitting kink. The drain tee in the run of the main allowed the water to dash by and make trouble at the elbow beyond it. View at right shows the correction

carelessness by one of my employees (who should have known better). The sediment pocket and drain on this large and long vacuum steam supply main failed to arrest and care for the flood of condensate ensuing when steam first was turned into it or when the branch marked "radiator" (which served a fan equipped intermittently operating ventilating apparatus) demanded a large quantity of steam. The drain tee in the run of the main allowed the water to dash by and to make trouble at the elbow beyond it.

The sketch for item 10 applies to a large, old single pipe heating system in an important general office building. With patience exhausted from over-heating and under-heating and excessive fuel costs, the owner ordered the addition of pneumatic automatic temperature control.

However, he had the pneumatic valves installed on the old radiator branches above the floor by a contractor who apparently was more experienced with sewers than with steam pipes. This man thought it would be easier to fit the globe valves under and behind the costly walnut radiator enclosures, if the valve stems were placed in vertical position. His thought was kind, but the scheme didn't pan out!

I have an unhappy memory of having allowed a contractor, for convenience, to install several big gate valves with stems looking down on bypass pipes on the forced hot water circulating mains of a heating system served by a public service company. The water came in under-



ITEM 10 APPLIED to the heating of a general office building. The problem was solved by changing the valve installation, as indicated here

ground pipes for several miles.

All was well, apparently, for a year or so, until an emergency developed requiring the opening of these long-closed valves. The recesses in the bodies provided for the gates had filled with solidified muck from the hot water mains.

We did not succeed in opening these valves. It was necessary to replace them, with valves that had stems looking up. This is an elegant example of the basically different characteristics between globe valves and gate valves.

QUESTION —

[*Concluded from page* 104]

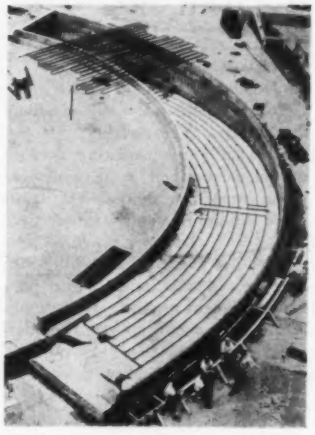
ing is satisfied and shuts the boiler off, the convectors cool off more rapidly than the cast iron radiation and the rooms become colder more quickly.

There are two ways, I believe, that the trouble could be corrected:

1) The thermostat, which is now located in the old building where the cast iron radiators are installed, could be moved to the new addition where the convectors are used. This would tend to maintain a constant temperature in the new wing and perhaps give a little over-heating where the cast iron radiators are used.

2) The better way would be to put a steam control valve in the main supplying the cast iron radiators and locate the second valve in the line supplying the convectors. Each valve would be controlled by a thermostat located in its respective section of the building. After this is done, the controls on the boiler should be changed so that a constant pressure is maintained on the boiler at all times.—G.C.D.

THE UNITED NATIONS building in New York City is being provided with a snow and ice melting pipe system, embedded in the circular concrete ramp leading down into the garage at the main entrance plaza. The parking areas in front of the building will also be kept clear by embedded wrought iron pipe coils warmed when needed by circulating water



Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL *SECTION*

A Survey of Electrostatic Precipitation

By Eric A. Walker* and John E. Coolidge, State College, Pa.**

SUMMARY — This paper gives a short historical outline of the development of electrostatic precipitation and indicates its importance in modern manufacturing processes. The mechanism of electrostatic precipitation is reviewed. It is pointed out that theories have been advanced for a number of specific processes, but none of these theories does, or can, completely account for all phases of the problem and, to date, some factors apparently have not been considered.

ALTHOUGH one can find references to electrostatic precipitation and the attraction of charged dust particles by Gilbert, as far back as the year 1600, the first comprehensive outline of the problem was presented by Lodge in 1884. Lodge claimed industrial dust in the atmosphere was becoming an increasing hazard and demonstrated its removal by means of an electric spark. His attempt at practical application however was not a success; in the most part because of an unfortunate choice of material: choosing lead fume which is now known to be among the most difficult solids to precipitate.

In 1911 Cottrell constructed the first successful electrostatic precipitator. His success was aided by new high voltage techniques developed since Lodge's attempt and a more fortuitous choice of material, sulfuric acid mist, to precipitate.

From this slow start electrostatic precipitation has grown to an immense business in both this country and Europe and many major installations have been made to precipitate a wide variety of materials. The smallest are household ventilation units while the major units include such giants as fly ash installations handling 200,000 cfm and precipitating some 200 tons of ash per day.

Unfortunately an understanding of the fundamentals involved in the process has not had such an impressive growth. Some effort is being directed toward remedying this situation but electrostatic precipitation must still be classed as an art, not a science.

Method of Operation

The simplest type of treatment chamber consists of a wire and concentric cylinder with a high voltage maintained between the wire and cylinder to produce a voltage discharge. The dust laden air is passed through the cylinder where the dust is charged by the corona discharge, and is then transported by the associated electric field to the cylinder where it can be collected. The dust is removed by mechanical rapping or flushing with an appropriate fluid. A variation of this arrangement is a wire flat-plate unit. The principle of operation is the same.

Mechanical commutator power supplies are widely used because of the high voltage they will rectify (as high as 100 kv) with few failures. Such units have the disadvantages of radio interference, high maintenance costs and fire hazard to the extent that vacuum tube type rectifiers (used successfully in lower voltage applications) are rapidly replacing them.

Theories of Electrostatic Precipitation

In many applications it is advisable to treat precipitation as a single operation and express its action in terms of its overall physical factors, *i.e.;* the amount of dust put into the precipitator, the length of time it is under the influence of the precipitator, etc. Under these considerations an equation for the efficiency of precipitation can be written as

$$\eta = 1 - e^{-x} \qquad (1)$$

where

η = the ratio of dust removed to the dust which enters
x = a factor involving many variables.

Such an expression has been derived by Anderson, Horne, Deutsch and possibly others. It is of limited use

*Director of Ordnance Research Laboratory and Head, Electrical Engineering Department, The Pennsylvania State College.
**Associate Professor, Engineering Research, The Pennsylvania State College.
Presented at the 57th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Philadelphia, Pa., January 1951.

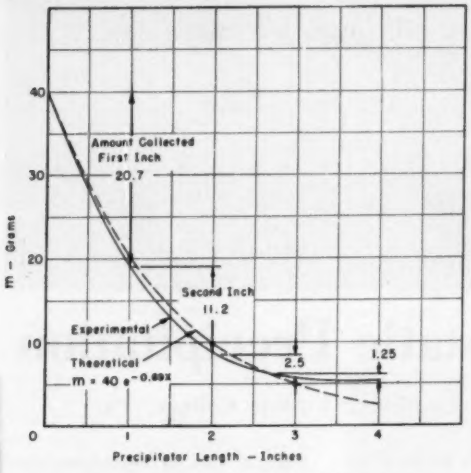


Fig. A—Precipitator collection *vs.* precipitator length

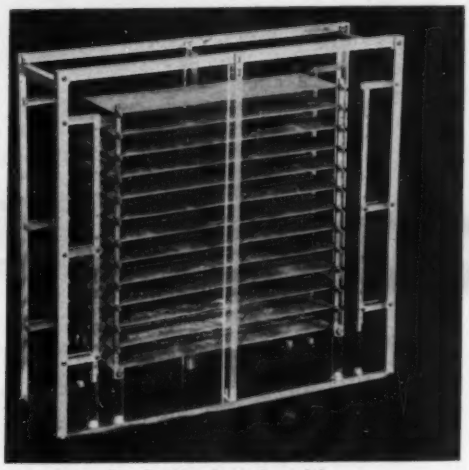


Fig. B—Experimental precipitator

especially in predicting the behavior of completely new materials and conditions. The general form of the expression appears in accord with the results shown in Fig. A in which x becomes a distance along the precipitator. This curve was obtained with the experimental precipitator shown in Fig. B.

A consideration receiving increasing attention to make units more efficient is gas distribution. It is obviously desirable to make each section of a precipitator bear equal load.

An understanding of the individual processes of electrostatic precipitation is essential to intelligent design and improvement in operation. The following discussion is a brief outline of these processes along with their status.

Precipitator Corona

In view of the great amount of work which has been devoted to the study of corona, surprisingly little has been done on corona in a gas contaminated by fume or dust. This contamination alters the discharge tremendously as will become evident.

Conditions are quite different in negative wire corona, from those in positive wire corona. In general the differences can be given as: (1) negative wire corona is highly localized; depends on the characteristic of the wire for a sustained discharge; is bead-like in appearance; produces ozone; (2) positive wire corona is a broad discharge; depends on the gas—not the wire—for being sustained; has a glow-like appearance; reduced ozone; (3) for clean metal electrodes, the arc-over voltage for negative corona is about twice that of positive.

The mechanisms of positive wire corona are susceptible to theoretical analysis; the current and electric field can be calculated from the geometry of the arrangement and the applied voltage. However, the capricious nature of the sustaining mechanism of negative wire corona allows no simple general formula to be derived either for the current or the electric field.

The presence of the dust in a precipitator makes additional considerations necessary above that of corona discharge with clean electrodes. The previous history of the precipitator, the gas velocity, the humidity, the composition of the gas and the other factors which are less comprehensible alter the electric discharge. Fig. C represents the dependence of precipitator current on relative humidity before, during, and after a precipitator run with gypsum. The theory behind these changes is not understood but they illustrate the pronounced effect of humidity and dust on the electric discharge.

The first important consideration in the design of an electrostatic precipitator is the capacity of the power pack. This is calculated from the length of the corona wire employed. Thus an important design constant is the *milliamperes per foot* at the operating voltage. From our previous discussion it can be seen that this relation is extremely difficult to obtain from theoretical considerations. In addition, it is found by actual measurements that the variation in successive current readings may be as much as 20 percent from reading to reading. If one attempts to measure the current as a function of the length of the wire, results are even more uncertain. Thus power pack design is a case where intuition is an important factor.

One might question the desirability of employing negative corona in precipitators. However, from an operational standpoint its one advantage of higher arc-over voltage outweighs its disadvantages.

The electric field strength distribution in simple geometric shapes in the presence of an electric discharge can be predicted from theoretical considerations for positive wire operation but not for negative. Probe

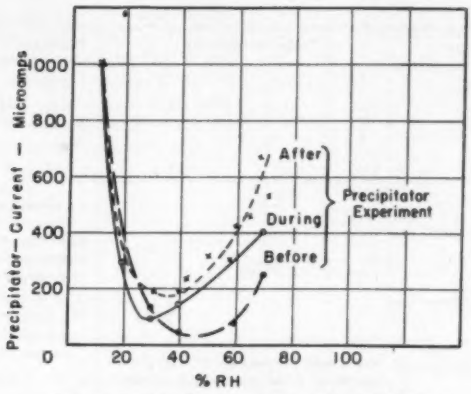


Fig. C—Precipitation current *vs.* relative humidity
(7750 volts; 3.5 fps; 5 grains/cu ft; 78 F; gypsum)

measurements of the electric field are unsatisfactory. An approximate expression for the field strength is:

$$E = \frac{V - V_c}{R - a} \quad \text{.....(2)}$$

where

E = field strength
V = applied voltage
V_c = critical corona voltage
R = radius of cylinder
a = radius of wire.

Charging the Dust

There are two schools of thought concerning mechanism by which the dust particles become charged: (1) the electric field is the main cause of the action; (2) the kinetic energy of heat motion produces the action. Table 1 gives a summary of the theories proposed and their individual considerations. Ladenburg is the principal proponent of the first theory. He states that when the electric charges which are propelled to the particle by the applied field are numerous enough to set up a local field equal to the applied field at the surface of the particle, the charge has reached the maximum. This maximum is given by:

$$n_m = \frac{K E_A r^2}{e} \quad \text{.....(3)}$$

where

E_A = applied field
r = particle radius
e = electron charge
$K = 1 + 2[(\epsilon - 1)/(\epsilon - 2)]$
ϵ = dielectric constant.

Ladenburg says nothing about the time required for deposit. Pauthenier started from Ladenburg's basic assumption, but by defining an entry zone in terms of the charge on the particle was able to include the variation of charge with time.

Arendt and Kallman considered the kinetic energy viewpoint and were also able to arrive at a value for maximum charge. Deutsch expanded on this idea and considered the charging by kinetic energy and transportation simultaneously.

It is unfortunate that a quantitative discussion cannot be made of a comparison or application of the theories outlined here. In general the electric field proponents arrive at values higher than those from kinetic energy. Although many experiments have appeared to confirm Pauthenier's expression, the method of test and the inability of field calculation place such results in a doubtful light.

Transport Problem

The calculation of the time necessary to transport a charged particle can be made from a knowledge of the magnitude of the charge, the strength of the electric field, the size of the particle and Stoke's Law for viscous motion. As has been pointed out neither the charge nor the electric field is capable of accurate theoretical prediction at the present time so a transportation calculation is quite difficult. However estimates of transport time, based on existing theory, compared to precipitator exposure time can indicate the possibility of successful precipitation.

Discharging Dust

If the material comes in contact with the collector plate, it is then necessary that the particle give up its charge and assume the charge of the collector plate. If the resistivity of the deposited layer is extremely high this charge transfer becomes difficult, back voltages are built up, sparking and uneven current flow result and precipitation is difficult. Some studies have correlated the resistivity of the precipitated material with the efficiency of precipitation of the material. These studies indicate that if the resistance is less than 8×10^9 ohm-cm precipitation is easy, but if it reaches 10^{13} ohm-cm precipitation is almost impossible.

Many investigators have mentioned the desirability of humidifying the gas in order to improve precipitation under certain conditions. In accordance with this practice laboratory investigations show that relative humidity plays a prominent role in the precipitation of

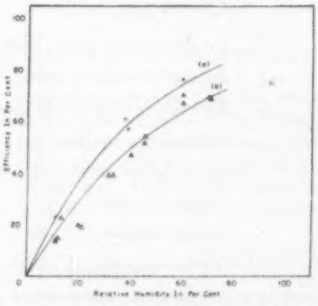


Fig. D—Efficiency *vs.* relative humidity
(Experimental precipitator; Gypsum No. 1; 3 grains/cu ft; 76 F — 80 F)
(a) 8400 volts — 3.5 fps.
(b) 7750 volts — 3.5 fps.

Table 1—Comparisons of Particle Charging Theories in a Corona Discharge

Author	Starting Point	Maximum Charge	Time to Charge	Transport Time
Ladenburg	Copious supply of charges. $E_s = E_a$ at surface of particle. Particles > 1u	$n_m = \frac{E_a r^2 K}{e}$	———	Stokes Law
Pauthenier	Same as for Ladenburg plus image forces. Defines a permissible particle entry zone for charging. Particles > 1u.	$n_m = \frac{E_a r^2 K}{e}$	$t = \frac{q}{\pi K_i f e (K E_a r^2 - q)}$	Stokes Law. Uniform field superior to exponential for transportation $t_e = \frac{t_0}{2} \ln\left(\frac{R_0}{r_0}\right)$
Arendt and Kallman	Kinetic energy required to deposit in field E_a against local field E_p. Particles < 1u.	$e\frac{dn}{dt}\left(1+\frac{xcr^2}{nK_i e}\right) = 4\pi r^2 xcfe^{-\frac{ne^2}{rkT}}$ n_m when $\frac{dn}{dt} \to 0$ ---------- when $t=0$ $\frac{dn}{dt} = 4\pi r^2 xcf$	For small percentage of charge minimum time can be calculated from $\frac{dn}{dt}$ at $t=0$ $n = 4\pi r^2 xcft$ for $n << n_m$	
Deutsch	Collisions by kinetic energy only. Does not consider E_a.	$ne = \frac{Lr}{ecx}\ln\frac{ur^2}{3\sqrt{\pi}We}$	———	$W = \frac{L}{6\pi necx}\ln\frac{ur^2}{3\sqrt{\pi}We}$ (Stokes Law)
Coolidge	Same as for Kallman	$\frac{n_m e^2}{r} \geq L$, $\frac{dn}{dt} \to 0$	$\int_0^n \frac{dn}{\frac{2\sqrt{\pi} r^2 E_a K_i f}{(KT)^{\frac{1}{2}}} \int_{\frac{ne^2}{r}}^{\infty} E^{\frac{1}{2}} e^{-\frac{E}{KT}} dE} = \int_0^t dt$	

where

n = number of elementary charges at time "t"

n_m = maximum number of elementary charges

r = particle radius

$K = 1 + 2\left(\frac{\epsilon - 1}{\epsilon + 2}\right)$

e = elementary electron charge

E_a = applied electric field

E_p = electric field of charged particle

ϵ = dielectric constant

q = charge on particle at time "t" = ne

f = ion density

K_i = ion mobility

c = ion velocity

x = proportion of particles sticking to particle (decimal)

K_b = Boltzmann's constant

T = temperature, absolute

L = mean kinetic energy of charging ions

u = mean molecular velocity

W = particle mobility

$\alpha = \left(1 - \frac{1}{2\sqrt{n}}\right)\left(1 - \frac{1}{\sqrt{n}}\right)$

L_0 = maximum kinetic energy of charging ions (arbitrarily chosen)

E = kinetic energy of a charging ion

t = time

t_e = transport time in an exponential field

t_0 = transportation time in a uniform field

R_0 = collector cylinder radius

r_0 = discharge wire radius

$\ln$ = logarithm

gypsum compound. Typical results are shown in Fig. D. The experimental precipitator used in these investigations is shown in Fig. B and employs thirteen 16-gage, 4 in. × 12-in. plates, spaced 1 in. apart with 4 wires, 20 mils in diameter, spaced equal distance between each pair of plates. The data suggest a relation for efficiency,

$$E = 1 - e^{-kh(V-V_c)} \quad \text{.....(4)}$$

where

V = applied voltage
V_c = critical corona voltage
h = fractional humidity
k = constant for the system.

This relation is applicable to the gypsum compound only. It appears however to agree with the aforementioned resistivity studies—the effect of the moisture probably giving a reduction in resistivity.

Removal of Precipitated Matter

The removal of liquid precipitates is usually not a problem. Solids adhere to the collector plate and must be removed by scraping or shaking. These methods result in re-entrainment of collected material which obviously is undesirable. Much effort has been devoted to preventing such re-entrainment but to the present time a totally effective method has not been devised. It is not the purpose of this article to discuss this particular aspect of the problem since in general it is an engineering one only.

Unsolved Problems

Early in this work it was noticed that dust could be precipitated by energized parallel plates without a corona discharge. Experiments revealed that the action was caused by the frictional electrification of the dust cloud during its dispersion and flow through the entrance duct to the precipitator. Because of the simplicity and low energy requirement of such a system studies were initiated on the properties of frictional electricity. These studies have not resulted in a complete understanding of the phenomenon. However, it is believed that further study will develop the possible applications of frictional charging.

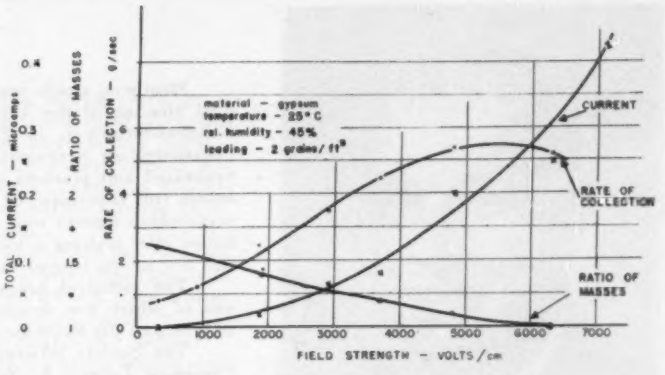


Fig. E—Characteristics of parallel plate precipitation

In the course of the studies of frictional electrification with parallel plates a discrepancy appeared between the measured current to the plates and that expected from the amount of material deposited and an estimate of the frictional charge. Further investigation indicated the explanation was electric re-entrainment. Electric re-entrainment can be described as follows: following initial deposition, the particle assumes the same polarity as the plate. As a result there is a repelling force set up between the plate and the particle because of their like charges. If this repelling force is greater than the mechanical forces holding the particle to the plate the particle will be re-entrained in the air stream. In parallel plate units it will travel to the opposite plate where the same action takes place. Thus a system of bouncing particles exists between the plates. These particles contribute to the current and explain the large magnitude of the measurements. Fig. E illustrates the effect of this action where at a field strength of 5000 volts per centimeter, although the rate of particle removal has reached a maximum, the current increases sharply. In this region the electric repelling forces dominate the mechanical adhering forces to a great extent.

The statement is often made that electrostatic precipitators are more adaptable to removing small particles than large ones. Theoretical consideration of particle charging and particle transportation indicates that the opposite is true. In fact, measurements of the particle size distribution of collected material along the experimental precipitator of Fig. B show that the larger particles are precipitated first. Of course, particle size distribution measurements are such that their results bear a somewhat tenuous relation to the actual distribution but measurements conducted in the same manner can indicate relative size.

The Effects of Resistance

It was pointed out earlier in this paper that studies have been made of the effects of the resistivity of the deposit on precipitation of various materials. In the early development of precipitation theoretical analysis was more or less confined to corona discharge, particle charging and particle transportation, but it appears increasingly evident that the action at the collector plate is the limiting factor in many installations. The exact nature of this action is not known and much further study is necessary for adequate understanding.

Acknowledgment

This research program was done under the sponsorship of the Koppers Co. to whom the authors express their appreciation.

57th Annual

Lester T. Avery, Cleveland, Ohio
President

Members, guests and ladies who attended the 57th Annual Meeting of the ASHVE, January 22-25, 1951, at The Bellevue-Stratford, in Philadelphia, Pa., found that the Committee on Arrangements of Philadelphia Chapter had organized and planned all of the events of the meeting to assure full enjoyment of the events of the week. The final registration figures were: members 1009, guests 433, and ladies 304, making a total of 1746, and consequently, this was one of the largest Annual Meetings held by the Society.

The technical program was presented in six sessions, one of which was devoted to a Symposium on the subject of *Man and His Relationship to Air.*

The Society officers elected for the year 1951 were: President Lauren E. Seeley, Durham, N. H.; First Vice President, Ernest Szekely, Milwaukee, Wis.; Second Vice President, Reg F. Taylor, Houston, Tex.; Treasurer, Howard E. Sproull, Cincinnati, Ohio. The four Council members elected for a three-year term were: John H. Fox, Toronto, Ont.; L. N. Hunter, Johnstown, Pa.; Neil H. Peterson, San Francisco, Calif.; and Benjamin H. Spurlock, Jr., Boulder, Colo.

New members elected to the Committee on Research for a three-year period were: A. B. Algren, Minneapolis, Minn.; John Everetts, Jr., Philadelphia, Pa.; T. H. Smoot, Marshalltown, Ia.; T. A. Walters and W. N. Witheridge, both of Detroit, Mich.

Society Committees which held meetings were the Executive, Finance, Membership, Guide, Charter and By-Laws, Ways and Means, Admission and Advancement, Chapters Conference and Nominating Committees. Research activ-

Proceedings

THE Society's 57th Annual Meeting and the 10th International Heating and Ventilating Exposition have established high attendance records.

FIRST SESSION, MONDAY, JANUARY 22, 9:30 A.M.

Pres. Lester T. Avery called the Annual Meeting to order at 9:30 a.m., and introduced Philadelphia Chapter President, John W. McElgin, who extended a cordial welcome to the members and guests and expressed the hope that at the end of the meeting they would feel that the choice of Philadelphia as a host had been a good one.

Pres. Avery's Response

On behalf of the officers of the Society, and in the name of the entire Society, it is my privilege to accept these cordial words of welcome and in my own turn say *we are all very glad to be here.*

You will recall that in January 1942 we last accepted the hospitality of the City of Brotherly Love and this meeting came shortly after the disaster at Pearl Harbor. The 7th International Heating & Ventilating Exposition which had been scheduled for that same period was cancelled at the last moment. We are indeed very happy to be able to join with you for this our 57th meeting and our 10th International Exposition. I need not say that your officers were greatly concerned last summer lest another war would cancel *this* Exposition. The 1st International Exposition was held here in Philadelphia in 1930. After 21 hectic years we come back for the 10th—that's a good anniversary.

We are here and the clouds of war hang over us. More able men than I have discussed the problems and the potentialities of the political and economic program. Insofar as your Society is concerned we recognize our responsibilities to members in service, and are cooperating to the full with the Government bodies in our research work. We stand ready to do anything else that we can to assist in the defense program.

It has been the custom for the President to give a brief report to the membership as to his stewardship and as to the condition of the Society. As one of our officers said when I expressed some impatience with lack of progress, "what is one year in the life of a Society such as this?" Well, it is one year of accomplishment or futility and frustration. Many things we have done and many things are left undone.

First I must give you the Council Report as required by the membership corporation laws of the State of New York.

President's Report

We have grown in numbers without putting any particular pressure on growth. We now total some 8312 members; over 1200 admitted this year. We now have 45 Chapters, of which three were formed during the year: Inland Empire, Spokane, Wash.; Miami Valley, Dayton, Ohio; and January, 1951 the Empire State Capital Chapter, Albany, N. Y. The Council has also accepted the application from a group in Wichita for a Kansas Chapter. We have 11 Student Branches, the last one being

Meeting

ities of the Society were discussed at several meetings of the Committee on Research and at meetings of Technical Advisory Committees concerned with Air Cleaning, Air Distribution, Combustion, Cooling Load, Panel Heating and Cooling, Heat Pump, Weather Design, Industrial Ventilation, Sensations of Comfort, Sound Control, Heating Load, Sorbents, and Heat Flow through Glass.

Special entertainment events included the Get-Together Luncheon on January 22 in The Bellevue-Stratford with Dr. Lillian M. Gilbreth speaking on the subject, *Management Problems in the Home;* an evening entertainment, A Night with the Pennsylvania Dutch, in the Benjamin Franklin.

The Annual Banquet was held in the grand ballroom of The Bellevue-Stratford on Wednesday, January 24, with Cameron Ralston, Gettysburg, Pa., as guest speaker, whose subject was *The Plagues of Democracy*. The Past President's Emblem was presented to retiring President Lester T. Avery by Past President and Charter Member, Homer Addams. President Avery announced that the F. Paul Anderson Medal had been awarded to Samuel R. Lewis, Chicago, Ill., Past President and Life Member of the Society, and would be presented at a later meeting.

The special events planned for the ladies included a Welcome Tea on Sunday; a Show and Tea in the Greek Room at John Wanamaker's store on Monday; on Tuesday a Brunch at the Hotel Warwick and a sightseeing tour of old and new Philadelphia and historic Valley Forge; a Luncheon and Fashion Show at the Hotel Warwick on Wednesday; and a special Bus Trip to Atlantic City with luncheon at Captain Starns on Thursday.

Lauren E. Seeley, Durham, N. H.
President-Elect

chartered at the University of Toronto. We have grown in numbers, and I think in strength.

Our financial report will indicate that we have grown financially and we have money in the bank. We have this year been recognized by the Internal Revenue Bureau as a true professional society, and our employees are now being covered under the Social Security Laws. The research program has been carried forward ably, as you will learn in more detail when the report of this activity is presented Tuesday morning.

This year marked the passing of three of our great leaders, Dr. E. Vernon Hill, Chicago, Dr. Willis H. Carrier, Syracuse, N. Y., and William H. Driscoll, Syracuse, N. Y. and Jersey City, N. J., each of whom had served this Society as president. It has been said, *A company is the projected shadow of a man,* and it must be obvious to you that this Society is the projected shadow of these men, and others like them, who gave unstintingly of their time to make it a truly great engineering society.

It has been my personal privilege to visit 21 Chapters this year as guest speaker, and to have met with officers of four other Chapters. Previous to this year I had the opportunity to meet with 18 other Chapters, so that in all, during the past few years I have visited 39 Chapters. I am sorry I could not visit the other six.

It was intended that other officers should visit the other Chapters, but about 15 Chapters were not visited by an officer this year. It seems to me that this is a mutual responsibility, and that at least one officer should visit each Chapter once a year.

It must be obvious to those of you who have been members more than 10 or 15 years that the Society is growing almost in a geometric ratio. Chapters will be established during the next few years in those cities where we have some members and a potentiality for substantial growth. We should expect to charter at least four or five Chapters each year during the next five years so that our growth can well be expected to encompass 65 Chapters and some 12,000 members by 1956. We just can't think and act like a small society.

I had hoped to see a greater activity in foreign branches this year, but the unsettlement in foreign affairs made that difficult. We do have hundreds of foreign members, particularly in the English-speaking countries, and they may well wish to form a branch of some kind and our plans should encourage it.

I am dwelling on this Chapter activity at some length because I feel that in the Chapter meetings we have our greatest new opportunity to serve the public, the non-member public of interested engineering and business people. The Chapter officers with whom I have visited will recall that I urged you to make your technical sessions open to the young engineer who may not be a member and may be unable to come to dinner. You should make a particular effort to bring to your Chapter meetings those engineers or scientists who are engaged in our profession, but who do not feel they can afford the privilege of membership.

Certain speakers at Chapter meetings are of particular interest to other professional or business groups. The architects, for example, the *Building Owners & Managers Association,* the *Home Builders Association,* the Public Health group, Industrial Hygiene Engineers and, of course, the most important of all, the Doctors, members of the Academy of Medicine or other medical societies. We should take time to look at our program and to invite those groups who might be interested in some particular subject. Let them join with us and give us the benefit of their participation in our meetings.

In Memoriam

WHEREAS *The American Society of Heating and Ventilating Engineers* has learned with deep sorrow of the passing on May 15, 1950 of Dr. E. Vernon Hill, their beloved fellow member and past president, and

WHEREAS, the Society has suffered the loss of a member of great distinction, one of the first of the medical fraternity to associate himself with the Society in the basic physiological approach for human comfort, a brilliant scientist whose accomplishments have received wide recognition, and

WHEREAS, in his passing, the Society has suffered the loss of one of its outstanding members who was greatly respected for his pioneering in the medical approach to problems of the Society and his continuing activity and energy in connection therewith, and

WHEREAS, he will be remembered for his guidance and wise counsel in the early years of the Society's research, his kindliness, his active mind and his wide interest,

THEREFORE, BE IT RESOLVED THAT WE, the members of *The American Society of Heating and Ventilating Engineers* assembled at the 57th Annual Meeting record our profound grief to his sorrowing family for their great loss, and

BE IT FURTHER RESOLVED THAT this resolution of our esteem and heartfelt sympathy be placed in the Proceedings of the Society and a copy be sent to his family.

WHEREAS, *The American Society of Heating and Ventilating Engineers* has learned with deep sorrow of the death on September 6, 1950 of their beloved member, William H. Driscoll, whose passing has taken one of the veterans in Society service, whose span of accomplishments covered nearly a half century, and who served as president and in manifold capacities through the years, and

WHEREAS, the Society has lost a man possessed of a deep sense of service as well as great engineering and executive ability, and

WHEREAS, in his passing the Society has suffered the loss of his unselfish devotion to its work, his vision, and tremendous energy and enthusiasm which have left a lasting impression on the development and welfare of the Society, and

WHEREAS, his fellow members will miss his genial presence and his generous advice and wise counsel,

THEREFORE, BE IT RESOLVED THAT WE, the members of *The American Society of Heating and Ventilating Engineers*, assembled at the 57th Annual Meeting record our profound grief to his sorrowing family for their great loss, and

BE IT FURTHER RESOLVED THAT this resolution of our esteem and heartfelt sympathy be placed in the Proceedings of the Society and a copy be sent to his family.

WHEREAS, *The American Society of Heating and Ventilating Engineers* has learned with sincere sorrow of the passing on October 7, 1950 of Dr. Willis H. Carrier, their beloved fellow member and past president, and

WHEREAS, the Society has suffered the loss of a member of great distinction; a pioneer in air conditioning; a brilliant engineer and scientist whose accomplishments have received world wide acclaim, and

WHEREAS, in his passing the Society has lost one of its outstanding members who was greatly admired as a man and revered as a master in the field he had chosen for his life work, and

WHEREAS, he will be remembered for his modesty, kindliness, and loyalty as a friend, whose many splendid traits of character endeared him to all of our members,

THEREFORE, BE IT RESOLVED THAT WE, the members of *The American Society of Heating and Ventilating Engineers*, assembled at the 57th Annual Meeting at Philadelphia, Pa., hereby express our profound sorrow, our sense of great loss, and the high esteem in which his memory is held, and further that a copy of these resolutions be presented to his family and spread upon the minutes of this meeting.

Respectfully submitted,
S. R. LEWIS, *Chairman*
HOMER ADDAMS
A. E. STACEY, JR.

Our literature, our Charter and By-Laws say that we conduct our affairs for the benefit of the general public and that all the things we know, the truths we learn, and the developments we make, are brought to the attention of the general public. We are properly classified as an engineering society, and we are dedicating a large portion of our resources to carrying on research work. If, as I suggest, we now have 45 Chapters and will soon have more, and if each of these has a monthly meeting serving some 50 to 100 people, you can see the impact on our membership and upon the guests when we make the effort to bring our story to the people interested. Please understand, I am not urging a large increase in membership. I am simply suggesting that we use the facilities we have to help bring our information to those in our particular communities who might be helped by it.

As you will note, your Society is engaged in studying the truth about man and his environment and his control of that environment. We are dealing with factors equally significant with those of the medical profession. We cannot deny the relationship of man to his air nor the effect of air on mankind. So you do not need to apologize when you bring your message to the attention of others besides your own membership.

Know the truth and the truth shall make you free. The papers and discussion which will be presented here, the exhibits at the International Heating and Ventilating Exposition, and the contacts you make as individuals are all a part of the program to get down to basic facts which will help you aid the other fellow in his daily contact with heating, ventilating and air conditioning problems. To the men of Philadelphia I say: "Thanks for inviting us here. I am sure we will have a very fine meeting."

Report of Council

As required by Section 46 of the Membership Corporations Law of the State of New York, the following report is presented and filed herewith.

Assets

The Society has the following Assets:

Land and Laboratory Buildings at Cleveland, Ohio	$ 81,012.89
Furniture and Equipment, Tools, etc. at New York and Cleveland	38,553.40
On Deposit in New York and Cleveland Banks	131,593.89
Securities (United States and Canadian Government Bonds) with Bankers Trust Company, New York, as Custodian	100,713.05
Accounts Receivable	18,174.46
Inventory Items	14,679.96
Deferred Items	4,668.12
Miscellaneous	2,844.23
Totals	$392,240.00
1949 Total	362,468.28
Increase	$ 29,771.72

The sources of Society Cash Receipts were: Admission Fees and Dues $113,169.57, Publications $155,787.55, from Research $143,528.20, Interest $1,049.89 and Miscellaneous $290.00, making a total of $413,825.21. Cash Disbursements for Meetings, Committees and Chapters were $25,703.30, Publications $112,253.45, Headquarters $94,287.00, Research $174,636.17 — Total $406,879.92.

The Society's Reserve Fund was increased by the addition of $6,345.50 Admission Fees and $10,000.00 from the General Fund and Interest Earned on Savings Accounts and Securities of $1,431.48 in the Reserve Fund. Investment of $13,486.50 of the Reserve Fund in U. S. Government Savings Bonds Series "F" was made.

Now in the Custodian Account of the Bankers Trust Company, New York, there are Securities of the United States and Canadian Governments — General Fund which cost $36,110.75, Reserve Fund $53,631.50 and F. Paul Anderson Fund $1,000.00. The Research Reserve Fund was reduced during the year by $10,000.00 to $21,252.46 to meet operating needs.

Liabilities

The Society has the following liabilities

Federal Withholding Taxes	$ 552.70
Accrued Salaries and Advertising Commissions	11,597.66
Deferred Research Projects	9,156.89
Prepaid Admission Fees and Prepaid Dues	14,585.48
Reserve for Transactions	28,646.94
Net Worth	327,700.33
Total	$392,240.00

At the end of the fiscal year, October 31, 1950, the Balance Sheet shows the Society's Net Worth as $327,700.33 compared to $300,797.28 on October 31, 1949, a net gain of $26,903.05.

The Property funds covering the Laboratory Land and Buildings at Cleveland, Laboratory Equipment and Tools, Furniture and Fixtures at Headquarters, New York and Cleveland is $119,566.29

Fire Insurance of $151,000.00 is carried on Buildings, $40,000.00 on Contents, Sprinkler $11,000.00, also Comprehensive Bodily Injury $100,000.00-$300,000.00 and Auto Property Damage $5,000.00. Fidelity Bonds on Officers and all employees $20,000.00. Workmen's Compensation is carried in New York and Ohio as required by law.

The Society has contributed to the Employees Retirement Plan Trust $2,357.55 and the participating employees contributed a similar amount.

Total Cash in New York and Cleveland Banks $131,593.89, consisting of $84,762.91 in the general operating fund, $6,454.23 in the Reserve Fund, $138.47 in the F. Paul Anderson Fund, $18,311.72 in the Research Fund, $21,252.46 in Research Reserve, and $674.10 in Research Endowment.

Dr. Lillian Gilbreth speaking on Management Problems in the Home at Welcome Luncheon, Bellevue-Stratford, Philadelphia, with A. J. Nesbitt and Charles S. Leopold

Membership

The Society admitted the following members in the grades indicated since January 1, 1950:

Members	216
Associate Members	94
Affiliates	190
Junior Members	305
Students	399
Total	1,204

The names and addresses of the candidates for membership were published in the Journal of the Society each month during the year and are on record in the Secretary's office. The present membership total is 8,312.

LESTER T. AVERY, President
REG F. TAYLOR, Treasurer

Dated New York, N. Y. January 22, 1951

At the conclusion of President Avery's report, Alfred E. Stacey, Jr., presented Special Resolutions referring to the passing of Dr. E. Vernon Hill, Mr. William H. Driscoll, and Dr. Willis H. Carrier, past presidents of the Society, who had died during the year. The Resolutions (see p. 114) were adopted by a rising vote, during which an interval of silence was maintained in memory of these distinguished Society members.

The following Report of the Treasurer was presented by Reg F. Taylor:

Treasurer's Report

As Treasurer of the Society during the past year, I would like to make a brief report on the work of that office. The Finance Committee has a great part in the financial affairs and the report of Frank G. Tusa & Co., Certified Public Accountants, will be published in the JOURNAL. This report covers the fiscal year ending October 31st, 1950, wherein you will find the exact condition of Society financial affairs.

When I joined the Society in 1915, I was presented with a copy of the TRANSACTIONS, No. XXI, date 1915, which I still have. In that copy there is the Treasurer's report in the form of a balance sheet for the year 1914. The expenditures for that year were $6,587.66 or an average of $549.00 per month, and there was carried over for the year 1915 a balance of $2,344.38. The balance sheet total was $8,932.04.

Comparing this to our present operations, we now have a budget set up for the period from November 1, 1950 to October 31, 1951 providing for the disbursement of $468,750.00 of which $191,700.00 is for Research.

The same copy of TRANSACTIONS I have already referred to gave the total membership as of January 2nd, 1915, as 507. Our present membership is approximately 8,312 which is 16 times what it was in 1915. We find, too, that the cost per capita in 1915 was $13.00 per member. This cost, now a little over four times that of 1915, can be accounted for, I think, first by the general increase in values as compared to 1915, probably double, and second, by the generosity of the contributors to research and the amount of research we now carry on.

The Society now has a net worth of approximately $327,700.00. Among its assets are the Land and Laboratory Buildings at Cleveland and the furniture and equipment, tools, etc. at New York and Cleveland, representing nearly $120,000.00. In addition, the Society owns securities in the form of United States and Canadian Government Bonds, amounting to $100,713.05.

Gentlemen, we can unquestionably be immensely proud of our accomplishments which have ranked us high in the standing of Engineering Societies. We can also take pride in the service we have rendered our fellow man, and as time goes on, we hope to continue and increase that service.

Respectfully submitted,
REG. F. TAYLOR, *Treasurer*

Accountant's Report

Frank G. Tusa & Co.
Certified Public Accountants
37 Wall St.
New York 5, N. Y.

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
51 Madison Avenue
New York, N. Y.

Gentlemen:

Pursuant to your request, we examined the books of account and records of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS — New York and Cleveland and its related funds for the fiscal year ended October 31, 1950, and submit herewith our report.

The audit covered a verification of the Assets and Liabilities as of the close of business October 31, 1950. For the fiscal year then ended, the recorded cash receipts were traced into the depositories; the cancelled bank checks were inspected and compared with the record of cash disbursements, and the disbursements were supported by payment vouchers. The dues from members and the interest from investments were accounted for.

A balance sheet reflecting the financial condition of the Society as of the close of business October 31, 1950 is submitted herewith and your attention is directed to the following comments thereon:

CASH

The cash on deposit was verified by direct communication with commercial and savings banks and the balances reported to us were reconciled with those reflected by the books of the Society. A schedule of cash is included as a part of this report.

Checks representing the cash on hand for deposit were inspected by us and the cash on hand was counted.

MARKETABLE SECURITIES

The securities shown on the subjoined schedule were verified by direct communication with the Bankers Trust Co., where same are deposited for safekeeping. Securities have been included in the accompanying balance sheet at the cost of acquisition plus the accumulated and accrued interest earned thereon.

ACCOUNTS RECEIVABLE

Trial balances taken of the membership dues receivable and sundry debtors as of the close of business October 31, 1950 were classified and aged as follows:

DUES RECEIVABLE

MEMBERSHIP	AMOUNT
Members	$ 4,204.50
Associates	8,986.76
Affiliates	431.25
Juniors	1,646.50
Students	540.00
TOTAL	$15,809.01

AGING

1950	$15,285.51
1949	451.50
1948	61.00
1947	11.00
TOTAL	$15,809.01

SUNDRY DEBTORS

Unpaid charges made during October, 1950	$2,153.69
" " " September, 1950	945.47
" " " prior to September, 1950	3,194.97
TOTAL	$6,294.13

After writing off all receivables known to be uncollectible, it is our opinion that the reserves for dues and accounts receivable doubtful of collection reflected in the accompanying balance sheet are ample to cover collection losses that may be incurred.

RESEARCH GENERAL FUND ACCOUNT RECEIVABLE

The balance due to the Research General Fund from the Society as of October 31, 1950 represents 40 percent of Dues Receivable from Members, Associates and Affiliates as of such date.

INVENTORIES

The following inventories were verified either by count or direct communication:

Transactions	$ 3,649.08
Emblems	299.75
Guide Paper	10,731.13
TOTAL	$14,679.96

A Schedule of Transactions inventoried follows:

Volume	Year	Quantity	Price	Amount
1-48	1895-1942	3,112	$ .40	$1,244.80
49	1943	224	1.39	311.36
50	1944	177	1.82	322.14
51	1945	332	1.91	634.12
52	1946	404	1.67	674.78
53	1947	261	1.77	461.98
TOTAL				$3,649.18

DEPOSIT RECEIVABLE

The deposit placed with the United Air Lines in the sum of $425.00 was verified by direct communication.

ADVANCES

The indebtedness from employees in New York and Cleveland represents advances to the employees retirement plan in the sums of $1,433.46 and $985.77 respectively. This indebtedness is to be reimbursed by the trust during the ensuing fiscal year.

DEFERRED CHARGES

The following prepaid expenses comprise the deferred charges included as assets in the accompanying balance sheet:

Prepaid H.P.A.C. Subscriptions	$2,550.61
Prepaid Advertising Sales Promotion	1,200.00
Prepaid Insurance Premiums — New York	193.25
Prepaid Insurance Premiums — Cleveland	724.26

PERMANENT ASSETS

The land and buildings, instruments, equipment and furniture and fixtures are reflected on the balance sheet at cost of acquisition. With the exception of land and buildings all assets have been depreciated at the rate of 10 percent per annum. During the year fully depreciated furniture and fixtures in the amount of $287.63 was written off against the reserve.

In accordance with the resolution adopted by the council at its meeting of January 23, 1949 depreciation was not provided on the buildings for the current fiscal year.

TAXES

The sum of $552.70 represents Federal income taxes withheld from employees salaries during the month of October, 1950.

ACCRUED ACCOUNTS

The salaries and commissions accrued as of October 31, 1950 have been computed by us in accordance with the Finance Committee report of April 8, 1948. Other accruals cover various expenses applicable to the current fiscal year.

DEFERRED INCOME

The prepaid dues and initiation fees by members and candidates for membership have been deferred to future operations. The membership classification of the dues prepaid by elected members follows:

MEMBERSHIP	AMOUNT
Members	$ 6,263.00
Associates	4,268.00
Affiliates	314.14
Juniors	1,094.34
Students	78.00
TOTAL	$12,017.48

The balance sheet of the Society also reflects as deferred income, balances in the various earmarked funds unexpended as at October 31, 1950.

RESERVE FOR TRANSACTIONS

Out of the sum of $12,000.00 budgeted for the publication of Volume 54 there remains a balance of $3,646.94 which is considered ample for the completion of this publication. In conformity with the 1949 and 1950 budgets reserves have been provided for the publication of Volumes 55 and 56.

FUNDS

There is included as a part of this report an analysis of funds reflecting the changes that occurred therein during the fiscal year ended October 31, 1950.

INSURANCE

The insurance coverages of the Society follow:

Fire — Buildings (Cleveland)		$151,000.00
Fire — Personal Property:		
Cleveland	$19,000.00	
New York City	20,000.00	
Printers	1,000.00	40,000.00
Sprinkler Leakage		11,000.00
Comprehensive — Bodily Injury		100/300M
Comprehensive — Property Damage — Automobiles		5,000.00
Parcel Post Open Policy		600.00
Commercial Blanket Bond on all Employees including the President, Treasurer and Chairman of the Finance Committee		20,000.00
Workmen's Compensation		

Respectfully submitted,

FRANK G. TUSA & CO.
Certified Public Accountants

BALANCE SHEET

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—
New York, N. Y.
October 31, 1950

ASSETS

GENERAL FUND				
CASH				
On Hand and on Deposit			$84,762.91	
SECURITIES				
At Cost (Market Value $38,400.97)		$36,110.75		
Add: Accumulated Interest		2,267.05	38,377.80	
ACCOUNTS RECEIVABLE				
Membership Dues	$15,809.01			
Less: Reserve for Doubtful	12,000.00	3,809.01		
Advertisers and Sundry Debtors	6,294.13			
Less: Reserve for Doubtful	1,000.00	5,294.13		
Initiation Fees		77.00	9,180.14	
INVENTORIES			14,679.96	
DEPOSIT WITH UNITED AIRLINES			425.00	
ADVANCES TO EMPLOYEES PENSION TRUST			1,433.46	
DEFERRED CHARGES			3,945.86	$152,803.13
RESEARCH GENERAL FUND				
CASH				
On Hand and on Deposit			18,311.72	
ACCOUNTS RECEIVABLE				
40% of Dues	5,449.00			
Less: Reserve for Doubtful	4,000.00	1,449.00		
Due from U.S. Navy Department		8,994.32	10,443.32	
ADVANCES TO EMPLOYEES			985.77	
DEFERRED CHARGES			724.26	30,465.07
PROPERTY FUND				
Land and Buildings		84,920.96		
Less: Reserve for Depreciation		3,908.07	81,012.89	
Laboratory and Equipment (Cleveland)		50,157.89		
Less: Reserve for Depreciation		18,693.93	31,463.96	
Furniture and Fixtures — (New York)		8,555.20		
Less: Reserve for Depreciation		2,065.76	6,489.44	
Library			300.00	
Tools			300.00	119,566.29
RESERVE FUNDS				
Cash on Deposit			27,706.69	
Securities at Cost (Market Value ($61,322.75)		53,631.50		
Add: Accumulated Interest		7,691.25	61,322.75	89,029.44
ENDOWMENT FUNDS				
F. PAUL ANDERSON FUND				
Cash		138.47		
Securities	1,000.00			
Add: Accrued Interest	12.50	1,012.50	1,150.97	
RESEARCH				
Cash on Deposit			674.10	1,825.07
				$393,689.00

LIABILITIES

GENERAL FUND				
FEDERAL WITHHOLDING TAX			$ 552.70	
DUE RESEARCH			1,449.00	
ACCRUED ACCOUNTS				
Salaries and Commissions		$ 9,250.15		
Expenses		2,347.51	11,597.66	
DEFERRED INCOME				
Prepaid Membership Dues:				
Elected Members	$12,017.48			
Candidates	715.00	12,732.48		
Prepaid Admission Fees		1,753.00		
Past President's Award		100.00	14,585.48	
RESERVE FOR PUBLICATIONS				
Transactions—Vol. 54		3,646.94		
Transactions—Vol. 55		12,500.00		
Transactions—Vol. 56		12,500.00	28,646.94	$ 56,831.78
RESEARCH GENERAL FUND				
DEFERRED INCOME				
Sound Energy Studies			574.39	
Summer Infiltration			500.00	
Panel Heating Studies			5,582.50	
Odor Studies			2,000.00	
Heat Flow Through Roofs			500.00	9,156.89
FUNDS				
General Fund			95,971.35	
Research General Fund			21,308.18	
Property Fund			119,566.29	
Reserve Fund			67,776.98	
Research Reserve Fund			21,252.46	
F. Paul Anderson Fund			1,150.97	
Endowment for Research Fund			674.10	327,700.33
				$393,689.00

CONDENSED COMPARATIVE BALANCE SHEET

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—
New York, N. Y.
October 31, 1950

ASSETS	October 31, 1950	October 31, 1949	Increase Decrease
Cash on Hand and on Deposit	$131,593.89	$124,703.13	$ 6,890.76
Securities (At Cost—Plus Accumulated Interest)	100,713.05	95,392.19	5,320.86
Accounts Receivable (Less: Reserve for Doubtful)	18,174.46	21,396.43	(3,221.97)
Inventory of Paper, Emblems, Etc.	14,679.96	4,670.68	10,009.28
Deposits Receivable	425.00	437.00	(12.00)
Accommodations	2,419.23	2,784.23	(365.00)
Land and Buildings (Less: Reserve for Depreciation)	81,012.89	81,012.89	-0-
Laboratory Equipment, Tools, Furniture, Fixtures and Library (Less: Reserve for Depreciation)	38,553.40	26,984.43	11,568.97
Deferred Charges	4,668.12	5,087.30	(419.18)
TOTAL ASSETS	$392,240.00	$362,468.28	$29,771.72
LIABILITIES			
Accounts Payable	$ -0-	$ 118.75	$(118.75)
Federal Withholding Taxes	552.70	465.60	87.10
Accrued Accounts	11,597.66	12,208.47	(610.81)
Deferred Income:			
Research Projects	9,156.80	18,398.14	(9,241.25)
Prepaid Dues, Initiation Fees, Etc.	14,585.48	4,328.19	10,257.29
Reserve for Publication of Transactions	28,646.94	26,151.85	2,495.09
TOTAL LIABILITIES	$ 64,539.67	$ 61,671.00	$ 2,868.67
FUNDS			
Property Funds	$119,566.29	$107,997.32	$11,568.97
Reserve Funds	67,776.98	80,718.10	(12,941.12)
F. Paul Anderson Fund	1,150.97	1,123.58	27.39
Endowment for Research Fund	674.10	659.17	14.93
Research Reserve Fund	21,252.46	30,560.06	(9,307.60)
General Fund	117,279.53	79,739.05	37,540.48
NET WORTH	$327,700.33	300,797.28	26,903.05
TOTAL LIABILITIES AND FUNDS	$392,240.00	$362,468.28	$29,771.72

STATEMENT OF INCOME AND EXPENSES

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—New York, N. Y.

For the fiscal year ended October 31, 1950

INCOME

INCOME FROM DUES				
104 MEMBERS	$75,281.58			
Less: Cancellations	562.50	$74,719.08		
Less: 40% to Research Fund		29,887.63	$ 44,831.45	
105 ASSOCIATES	72,830.17			
Less: Cancellations	1,245.00	71,585.17		
Less: 40% to Research Fund		28,634.07	42,951.10	
105a AFFILIATES		2,375.00		
Less: 40% to Research Fund		950.00	1,425.00	
106 JUNIORS		11,674.00		
Less: Cancellations		295.00	11,379.00	
107 STUDENTS		2,814.00		
Less: Cancellations		123.00	2,691.00	
TOTAL DUES				$103,277.55
OTHER INCOME				
108—Admission Fees			6,345.50	
109—Sales of Emblems			648.25	6,993.75
INCOME FROM PUBLICATIONS				
115—Editorial Contract			23,500.00	
300—Guides (Per Schedule Attached)			127,710.56	
117—Sales of Transactions			893.55	
118—Books, Reprints and Codes			1,832.14	153,936.25
INVESTMENT INCOME				
125—Interest—Savings Banks			382.91	
126—Interest—Securities			1,042.47	1,425.38
RESEARCH FROM ASHVE				
40% of Members and Associates Dues				$ 56,391.46
FROM U.S. NAVY CONTRACT				25,504.90
CONTRIBUTIONS				
GENERAL—PER SCHEDULE			$ 6,445.00	
EARMARKED				
Received during the Current Fiscal Year—Per Schedule	$46,709.29			
Add: Deferred from Prior Years	18,398.14	$65,107.43		
Deduct: Deferred to Future Operations		9,156.89	55,950.54	
1950 EXPOSITION CONTRIBUTION			15,757.13	78,152.67
INTEREST EARNED				10.39
				160,059.42
TOTAL INCOME				425,692.35

EXPENSES

COMMITTEES AND CHAPTERS—SCHEDULE F			
150—President's Fund	2,666.01		
151—Council Travel and Council Committee Expense	6,187.98		
170—Admissions and Advancement Committee Travel	540.74		
171—Constitution and By-Laws	195.61		
172—Nominating Committee Travel	996.69		
173a—Chapter Speaker Travel	2,497.06		
173b—Chapter Delegates Travel	4,077.97		
	17,162.06		425,692.35
173c—Chapter Relations Committee	360.69		
201—ASA Membership	100.00		
204—Membership Certificates	1,318.93		
205—Emblems	529.62		
206—Medals and Awards	172.80	19,644.10	
MEETING—SCHEDULE G			
163—Meetings	5,142.12		
327—Chapter Annual and Semi-Annual Meeting Allowances	1,682.81	6,824.93	
PUBLICATION—SCHEDULE H			
200—Members Subscriptions to HPAC	15,185.50		
202—Transactions—Volume 56	12,500.00		
203—Membership Roll	6,074.64		
108—Books, Reprints and Codes	1,636.66		
305—Guide—Publication and Distribution (Per Schedule Attached)	70,208.82	105,605.62	
HEADQUARTERS—SCHEDULE I			
210—Salaries—Secretary and Staff	54,767.82		
211—Public Relations and Research Promotion	6,799.37		
212—Traveling—Secretary and Staff	2,936.57		
213—Rent and Light	5,947.49		
214—Telephone	1,953.17		
215—Telegraph	448.23		
216—Postage	5,008.86		
217—Printing and Stationery	6,802.05		
219—Addressing and Address Changes	552.70		
220—Professional Services	4,092.65		
221—Bank Charges	50.10		
222—Insurance	163.64		
11—Depreciation of Furniture and Fixtures	797.22		
223—Office Expense	1,676.50		
224—Pension	1,279.46	93,275.83	
RESEARCH CHAIRMAN AND COMMITTEES			
Travel and Meeting Expenses	1,855.19		
Chairman's Office Expenses	421.99	2,277.18	
STAFF SALARIES, ETC.			
Administrative and Technical Staff	69,177.33		
Clerical Staff	11,589.05		
Pension Contributions	1,268.07		
Temporary and Part Time	3,559.58		
Consulting Services	5,557.20	91,151.23	
LABORATORY EXPENSES			
Staff Travel	6,026.53		
Postage	678.08		
Telephone and Telegraph	1,953.68		
Office Supplies	1,074.42		
Mimeographing and Printing	2,114.44		
Library	525.25		
Accounting Fees	425.61		
Staff Insurance	189.61		
Laboratory Materials and Supplies	8,344.27		
Bank Charges	16.09		
Depreciation of Equipment and Fixtures	4,257.30	25,605.28	
		119,033.69	160,059.42
LABORATORY OPERATION AND MAINTENANCE			
Heat	1,111.88		
Utilities	1,752.20		
Janitor's Wages and Supplies	3,506.29		
Building Maintenance	1,341.54		
Building Insurance	943.77		
Building Alterations	259.20	7,914.88	
NAVY CONTRACT			
Salaries	10,669.11		
Travel (Committee)	209.56		
Travel (Staff)	239.47		
Materials and Supplies	7,562.97	18,680.91	
COOPERATIVE RESEARCH AGREEMENTS			
Case Institute of Technology	2,250.00		
Columbia University	800.00		
University of Minnesota	4,200.00		
University of Illinois	6,419.29		
Kansas State College	3,600.00		
Michigan State College	500.00		
University of Florida	1,000.00	18,769.29	164,398.77
		168,398.77	393,749.25
			31,943.10

NET INCOME

OTHER DEDUCTIONS			
Admission Fees Allocated to Reserve Fund		6,345.50	
Provision for Dues Doubtful of Collection		7,276.12	
Provision for Accounts Receivable Doubtful of Collection		747.70	
Loss Due to Difference in Canadian Rate of Exchange		102.98	14,472.30
EXCESS OF INCOME OVER EXPENSES			$17,470.80

BUDGET COMPARISON—CASH RECEIPTS

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—New York, N. Y.

For the fiscal year ended October 31, 1950

	Actual	Budget Provision	Increases	Decreases
DUES—SCHEDULE A				
CURRENT MEMBERS				
6a—Members	$ 39,700.12	$ 45,000.00	$	$ 5,299.88
6b—Associates	34,894.39	42,000.00		7,105.61
6bb—Affiliates	796.61	-0-	796.61	
6c—Juniors	7,727.49	8,000.00		272.51
6d—Students	1,934.00	1,800.00	134.00	
	85,052.61	96,800.00	930.61	12,678.00
NEW MEMBERS				
104—Members	1,762.65	1,875.00		112.35
105—Associates	2,142.15	1,875.00	267.15	
—Affiliates	291.00	-0-	291.00	
106—Juniors	1,338.50	500.00	838.50	
107—Students	-0-	150.00		150.00
	5,534.30	4,400.00	1,396.65	262.35
PRIOR YEARS DUES				
6e—Members	1,195.45	600.00	595.45	
6f—Associates	1,599.25	900.00	699.25	
6g—Juniors	219.50	200.00	19.50	
6h—Students	16.00	90.00		74.00
	3,030.18	1,790.00	1,314.18	74.00
TOTAL DUES	93,617.09	102,990.00	3,641.44	13,014.35
108—Admission Fees	5,113.50	4,000.00	1,113.50	
DEFERRED INCOME				
6i—Prepaid unbilled Dues	1,258.83	500.00	758.83	
—Prepaid billed Dues	10,712.15	-0-	10,712.15	
6j—Prepaid Dues by Candidates	715.00	1,000.00		285.00
108a—Prepaid Admission Fees	1,753.00	1,000.00	753.00	
	14,438.98	2,500.00	12,223.98	285.00
PUBLICATIONS—SCHEDULE B				
115—Journal Contract	23,500.00	23,500.00	-0-	-0-
300—Guide Advertising	71,014.15	58,000.00	13,014.15	
302—Guide Copy Sales	58,378.14	52,500.00	5,878.14	
117—Transactions	901.09	1,000.00		98.91
118—Books, Reprints and Codes	1,994.17	500.00	1,494.17	
	155,787.55	135,500.00	20,386.46	98.91
INVESTMENTS—SCHEDULE C				
125—Interest — Savings Bank	381.72	300.00	81.72	
126—Interest — Securities	668.17	500.00	168.17	
	1,049.89	800.00	249.89	
OTHER RECEIPTS — SCHEDULE D				
109—Sale of Emblems	290.00	500.00		210.00
Exposition Fund	-0-	12,500.00		12,500.00
	290.00	13,000.00		12,710.00
RESEARCH LABORATORY RECEIPTS — SCHEDULE E				
40% of Members and Associate Dues	55,709.51	61,500.00		5,790.49
Contributions — Earmarked	46,709.29	60,000.00		13,290.71
Contributions — General	6,445.00	10,000.00		3,555.00
Contributions — Exposition	15,757.13	-0-	15,757.13	
Navy Research	18,347.59	37,500.00		19,152.41
Interest	559.68	-0-	559.68	
	143,528.20	169,000.00	16,316.81	41,788.61
TOTAL RECEIPTS	$413,825.21	$427,790.00	$53,932.08	$67,896.87

BUDGET COMPARISON—CASH DISBURSEMENTS

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—New York, N. Y.

For the fiscal year ended October 31, 1950

	Actual	Budget Provision	Increases	Decreases
COMMITTEES AND CHAPTERS — SCHEDULE F				
150—President's Travel	$ 2,384.96	$ 3,000.00	$	$ 615.04
151—Council Travel and Committee Expense	6,625.57	7,500.00		874.43
170—Admission and Advancement Committee	540.74	750.00		209.26
171—Constitution and By-Laws	195.61	100.00	95.61	
172—Nominating Committee	996.69	1,500.00		503.31
173a—Chapter Speakers	2,025.79	2,000.00	25.79	
173b—Chapter Delegates	4,077.97	4,500.00		422.03
173c—Chapter Relations Committee	352.02	600.00		247.98
201—ASA Membership Dues	100.00	100.00		
204—Membership Certificates	1,189.60	750.00	439.60	
205—Emblems	216.62	1,000.00		783.38
206—Medals and Awards	172.80	250.00		77.20
	18,878.37	22,050.00	561.00	3,732.63
MEETINGS — SCHEDULE G				
165—Meetings	5,142.12	5,500.00		357.88
327—Chapter Meeting Allowance	1,682.81	2,000.00		317.19
	6,824.93	7,500.00		675.07
PUBLICATIONS — SCHEDULE H				
200—Journal Subscriptions	15,089.40	15,000.00	89.40	
202—Transactions — Volumes 54 and 55	8,688.47	15,000.00		6,311.53
Transactions — Volume 56		12,500.00		12,500.00
203—Membership Roll	6,074.64	5,000.00	1,074.64	
208—Books, Reprints, Codes	1,727.08	500.00	1,227.08	
305 - 325—Guide Publications and Distribution	80,673.86	67,500.00	13,173.86	
	112,253.45	115,500.00	15,564.98	18,811.53
HEADQUARTERS — SCHEDULE I				
210—Salaries	54,639.82	67,600.00		12,960.18
210a—Social Security Tax		500.00		500.00
211—Public Relations and Research Promotion	6,820.29	8,500.00		1,679.71
212—Travel, Secretary and Staff	2,936.57	3,000.00		63.43
213—Rent and Light	5,825.56	8,850.00		3,024.44
214—Telephone	1,845.11	1,500.00	345.11	
215—Telegraph	571.93	500.00	71.93	
216—Postage	5,015.64	4,500.00	515.64	
	77,654.72	94,950.00	932.68	18,227.96
217—Printing and Stationery	6,777.12	5,000.00	1,777.12	
219—Addressing and Address Changes	407.60	500.00		92.40
220—Professional Services	4,892.65	3,000.00	1,892.65	
221—Bank Charges	50.10	500.00		449.90
222—Insurance	130.29	500.00		369.71
11—Furniture and Fixtures	1,453.66	1,500.00		46.34
223—Office Expense	1,641.40	1,500.00	141.40	
224—Pension	1,279.46	1,500.00		220.54
	94,287.00	108,950.00	4,743.85	19,406.85
RESEARCH — SCHEDULE J				
Research Committee Expenses	2,277.18	2,500.00		222.82
Staff Salaries	91,151.23	98,450.00		7,298.77
Laboratory Expenses	36,624.56	45,050.00		8,425.44
Laboratory Operation and Maintenance	7,133.00	9,000.00		1,867.00
Cooperative Contracts	18,769.29	22,500.00		3,730.71
Navy Research	18,680.91	26,250.00		7,569.09
	174,636.17	203,750.00		29,113.83
TOTAL DISBURSEMENTS	$406,879.92	$457,750.00	$20,869.83	$71,739.91

JOURNAL SECTION

Nominating Committee organizes *(L. to R.)* A. E. Stacey, Jr., P. J. Marschall, F. W. Chambers, A. J. Hess, B. L. Evans, I. W. Cotton, D. M. Hummel, G. L. Tuve, P. R. Achenbach, C. B. Gamble, W. M. Wallace, II, Leo Garneau

President Avery announced the first technical paper, Losses from a Floor-Type Panel Heating System, by F. W. Hutchinson, D. L. Mills and L. J. LaTart, which was presented by Mr. Mills (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1950). Written discussions were received from Barrington Le B. Musgrave, New York; William J. Hajek, Pasadena, Calif.; and E. L. Weber, Seattle, Wash., who were not present, and verbal discussions were given by J. M. Van Nieukerken, New York; P. B. Gordon, New York; and W. P. Chapman, Pittsburgh. The complete discussions, together with the authors' closure will be published later.

Mr. Musgrave referred to some of the difficulties arising from heat loss when using floor slabs on the ground, and stated that even with insulation at the edge he had found it necessary to allow for at least 20 percent heat loss downwards. He had also found by experience that when non-insulating materials were used, the coils should be 2 in. below the surface of the floor, while a distance of 1 in. below the surface would be satisfactory with insulating materials such as wood block and cork tile. Mr. Musgrave pointed out that in using floor panels it was important to design the system so that heating panels would not be prevented from delivering heat because of built-in furniture or other obstructions.

Mr. Hajek stated that the paper brought out the necessity of making a complete analysis of all factors affecting the design of the floor panel. Control of the panels by outdoor temperature appeared to offer the best approach if insulation were used, although control equipment anticipating indoor temperature might be satisfactory in many cases.

Mr. Weber stated that he always used insulation around the outer perimeter of floor slabs. Insulation had also been found necessary between the slab and the footing wall. In multi-story concrete buildings with monolithic slabs and walls, coils were not placed nearer than 10 or 12 in. from the wall. Mr. Weber considered 1 in. coverage for floor coils too small, and felt that a covering of 1¾ in. would be necessary to prevent possible cracking of concrete.

Mr. Van Nieukerken inquired why only 50 percent of the floor had been equipped with coils. He felt that if a larger area had been used, and therefore water temperatures had been reduced, the same heat loss might have been obtained from the slab to the ground, but that a lower edge loss would have been found.

A second question referred to the possibility that ground conditions under the slab might have been more severe in the installation tested than in other locations where ground drainage might have been better. Mr. Van Nieukerken referred to the great importance of insulating floor slabs from the ground, and stated that in some cases good insulation was provided by the porous ground itself.

Mr. Gordon pointed out that the use of insulation with a slab affected not only the downward heat loss, but also affected the outward-upward transfer into the room. He inquired whether the outdoor temperatures were available for the time of test runs. Mr. Gordon also asked whether the insulation separating the heated floor section from the unheated floor section projected below the slab itself, and if not, whether heat might not travel to a considerable extent from the edge of the heated panel into the adjacent panels, thereby adding heat to the test room.

The shallow depth of the tubes below the surface might be expected to cause sufficient temperature variation in the slab surface to make it difficult to obtain an average panel surface temperature. Mr. Gordon inquired whether there were other panels which supplied heat to the room during the test run. If not, it would be desirable to show a comparison of the heat output of the panels with the calculated heat loss of the room. It was also pointed out that accurate panel output should be determined by evaluating the radiation and convection outputs separately rather than by taking a value of heat output for a combined coefficient.

Mr. Gordon also mentioned that in considering the loss to the ground, the actual loss to be charged against a heated floor panel should be the total amount found, less the heat which would escape to the ground by any other method of heating.

Mr. Chapman referred to the difficulty of obtaining average surface areas by means of the heat meters which were approximately 3 in. by 3 in. in area. He pointed out the variations which might occur by locating the meter over the pipes or between the pipes, and felt that perhaps a considerable variation in the amount of heat loss could readily be obtained by the operator unless some means were used to insure that the heat loss measured by the meter actually represented the average panel heat loss.

Professor Hutchinson, in referring to Mr. Van Nieukerken's question, stated that the size of panel was selected such that it would function at 85 deg surface temperature, with a water temperature of approximately 95 deg. A larger panel would have necessitated lower surface temperature, with a consequent greater error because of a smaller temperature differential.

While outdoor temperatures had been taken, the authors had concluded that the readings which were sought in this paper were not affected by the outside temperature. Most of the temperature readings had been taken approximately at midnight because at this time steady state conditions were usually the best.

Insulation was used between the heating panel and the remaining floor surface, but did not extend under the slab. It was therefore obvious that heat transfer did take place to the unheated sections of the floor, and consequently, did reach the room. While the authors recognized the difficulty of obtaining an average surface temperature, they felt that by using a thermocouple to explore the entire surface, a satisfactory average had been found from the readings at the locations used in the test. During the period of test, heat was supplied only by the test panel. In the test, no attempt had been made to obtain a balance between the room heat loss and the panel output.

Professor Hutchinson agreed with Mr. Gordon that in speaking of the downward heat loss from a panel, it should be remembered that some loss would be obtained with any type of system.

President Avery announced that the Board of Tellers of Election would be H. K. Jennings, *chairman*, Cincinnati, Ohio; E. A. Dusossoit, Boston, Mass.; J. S. Kearney, Evans-

ton, Ill., and that the ballot box would remain open for five hours, after which the ballots would be counted in order that a report could be made at the next technical session.

The second technical paper, Operating Experience and Data from Sidewalk Snow-Melting System, by L. A. Stevens and G. D. Winans, was presented by Mr. Winans. (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1951).

Discussions were presented by L. J. LaTart, Rome, N. Y., G. Lorne Wiggs, Montreal, Que., and P. B. Gordon, New York, N. Y.

Mr. LaTart stated that in experimenting with three snow-melting installations, two of which had been made using black top walks and driveways, it had been found that a tube spacing of 6-9 in. on centers had produced good snow-melting patterns. In this case the depth of bury of the coil was from 1 to 1½ in. below the surface. Mr. LaTart inquired about the pattern of melting on a slab on which snow had accumulated. He also asked whether slushing conditions occurred between pipe rows when melting, and whether any noticeable cracks developed in the concrete.

Mr. Wiggs referred to snow melting in Montreal where the snowfall may be 100 in. or more per year. He felt that where a heavy snowfall might be expected, a light covering of cement over the pipes might cause a series of furrows, and that it might even be possible to melt the snow in tunnel shapes over the pipes without melting the snow at the top surface. Tunneling could be eliminated by reducing the spacing between pipes, or by burying the pipes at a greater depth.

Mr. Gordon stated that many snow-melting installations are operating with heat inputs of 130 to 150 Btu per (sq ft) (hr) and therefore the 400 to 500 Btu mentioned in the paper seemed to require some explanation.

Mr. Winans stated, in answer to Mr. LaTart's questions, that with an average annual snowfall in Detroit of about 40 in., the pattern of melting would be that of the grid, and that melting would start directly above the piping. Some slush conditions did occur when starting the system after snow had fallen. Mr. Winans had found that some snow-melting installations actually used a heat input of 1000 Btu per sq ft per hr, and this high value was thought to be due to a large edge loss from the panel. It was conceded that where the snowfall would be particularly heavy, it would be necessary to space pipes on narrower centers and to bury them at greater depths.

TAC on Weather Design meets *(L. to R.)* H. King McCain, A. T. Pickles (guest), R. S. Dill, W. M. Wallace, II, (Chairman) R. K. Thulman, John Everetts, Jr., T. H. Urdahl

President Avery then called upon C. S. Leopold to present his paper, Design Factors in Panel and Air Cooling Systems (complete paper with discussions to be published in the ASHVE JOURNAL SECTION, *Heating Piping & Air Conditioning*, April 1951). Discussions of this paper were given by G. Lorne Wiggs, Montreal, Que.; Edward Simons, San Francisco, Calif.; Albert T. Jorn, Libertyville, Ill.; and R. A. Gonzalez, Dayton, Ohio.

President Avery announced that a demonstration of the hydraulic analogue used by Mr. Leopold could be seen at his office between 2:30 and 3:30 p.m.

President Avery thanked the authors of the three technical papers which had been presented, as well as those who had offered comments.

The following Resolutions Committee was appointed by Mr. Avery, with instructions to report at the final technical session: S. W. Beaty, *Chairman*, Shreveport, La.; R. C. Chewning, Portland, Ore.; I. W. Cotton, Indianapolis, Ind.

The meeting was adjourned at 12:10 p.m.

SECOND SESSION, TUESDAY, JANUARY 23, 9:30 A. M.

First Vice President L. E. Seeley called the meeting to order at 9:30 a.m. in the Rose Garden of The Bellevue-Stratford, and asked chairman H. K. Jennings of the Board of Tellers of Election to present his report. The report is as follows:

Report of Tellers of Election

BALLOT FOR OFFICERS	Total
President, L. E. Seeley, Durham, N. H.	1837
1st Vice Pres., Ernest Szekely, Milwaukee, Wis.	1837
2nd Vice Pres., Reg F. Taylor, Houston, Tex.	1837
Treasurer, H. E. Sproull, Cincinnati, Ohio	1840
MEMBERS OF COUNCIL (*Three-Year Term*)	
J. H. Fox, Toronto, Ont., Canada	1837
L. N. Hunter, Johnstown, Pa.	1840
N. H. Peterson, San Francisco, Calif.	1838
B. H. Spurlock, Jr., Boulder, Colo.	1839
Total Ballots Received	1842
Total Legal Ballots	1841
Invalid Ballots	1
Scattering votes:	
President	4
1st Vice President	4
2nd Vice President	4
Treasurer	1
Council	7
Committee on Research	3
COMMITTEE ON RESEARCH (*Three-Year Term*)	
A. B. Algren, Minneapolis, Minn.	1838
John Everetts, Jr., Philadelphia, Pa.	1839
T. H. Smoot, Marshalltown, Ia.	1839
T. A. Walters, Detroit, Mich.	1839
W. N. Witheridge, Detroit, Mich.	1837

RESPECTFULLY SUBMITTED
HAL K. JENNINGS, *Chairman*
EDMOND A. DUSOSSOIT
JOSEPH S. KEARNEY

The first technical paper, The Efficiency of Bituminous Coal Burning Space Heaters, by J. W. Tieman and F. L. Bagby, was presented by Mr. Bagby (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, February 1951).

Discussions were received from C. L. Sapp, Wilmington, Ohio, O. J.

Ress, Milwaukee, Wis., and E. A. Erickson, Chicago, Ill, who could not be present at the Meeting. Discussions from the floor were offered by P. R. Achenbach and R. K. Thulman, both of Washington, D.C.

Mr. Sapp inquired whether the heating surface-grate area ratio, the method of introducing secondary air, or the variation in flue outlet size could account for the fact that deep firepot heaters showed a decreasing efficiency with increasing output while the smokeless heater and the surface fired heater showed an increase in efficiency under the same conditions.

Referring to surface fired space heater efficiencies of 55 to 56 percent (with a draft limitation of 0.02 in.) obtained by R. C. Cross in 1943, Mr. Sapp felt that perhaps the increase of draft limitation to 0.06 in. might be responsible in these tests for the lower heater efficiency reported in the paper.

It also seemed desirable to determine by field studies whether the relative efficiencies reported in the paper would be obtained in practice.

Mr. Ress pointed out that in the method of testing used it was important to prevent any heat from the smoke pipe from entering into the determination of the unaccounted-for losses. If the stack temperature in the flue loss determination were taken at the flue collar of the appliance, the heat dissipated from the smoke pipe into the enclosure would cause a similar difference between the flue loss of the unit and the calorimeter room reading with a corresponding reduction in calculated unburned fuel loss. If the stack temperature were determined at the ceiling, the heat dissipated from the smoke pipe into the room would be accounted for in the flue loss and leave a difference between that value and the room calorimeter reading which would be chargeable entirely to unburned fuel.

It was suggested that a series of tests be conducted in the calorimeter room to determine the amount of heat removed from the room by the barometric draft control.

Mr. Erickson stated that apparently the efficiencies of the two deep firepot heaters were nearly identical over the full range of outputs and that an ingenious liner design would seem to be necessary in heaters of this type. The results obtained seem to indicate that a formula for rating space heaters could be developed and be quite similar to the formula used for rating warm air furnaces. Referring to the authors' statement that deep firepot heaters might be expected to cause a certain amount of overheating because of lack of control, Mr. Erickson felt that owners of heaters prevented this overheating by operating with lower fuel depths. It was questionable whether the gains in heating efficiency as reported would be realized in practice because the customary installation of barometric dampers would remove 2,000 to 7,000 Btu per hr (depending on the amount of draft) from the room.

Dean Seeley cited some of his experiences with testing of space heaters burning wood and stated that equations for determining flue loss data must be proper for wood fuel if values obtained were to have sufficient precision.

He also remarked that a calorimeter room had been described by David Bull in 1830 and that Mr. Bull had felt very much annoyed because he had not received a medal from the Franklin Institute for his accomplishment.

Mr. Achenbach referred to similar tests which had been conducted at the National Bureau of Standards and inquired whether the authors had used an S-shape or a Z-shape pipe connection. Since the authors had determined the unaccounted-for losses by a difference between the heat input and all other losses it was obvious that any errors occurring in measuring the heat transmission from the walls or accounting for the heat loss from the flue pipe would be included in the unaccounted-for losses.

Mr. Thulman noted that the 2 deep firepot heaters were jacketed while the smokeless heater was not. He inquired whether the use of a jacket had an effect upon the efficiency.

He questioned the accuracy of the calorimeter method of measuring heater output because temperature gradients produced within the room by space heaters would cause a different heat loss from the room than that obtained in the test installation in which circulation was fairly uniform.

Mr. Bagby in replying to Mr. Achenbach stated that flue gas temperatures and flue gas analyses were obtained 20 in. from the flue collar. No difference had been found in the results obtained for the vertical flue pipe as compared with the Z-shape connection.

Referring to Mr. Thulman's questions, he stated that no difference in efficiency seemed to be due to effect of the jacket. The higher efficiency of the smokeless heater was attributed to more efficient combustion of hydrocarbons and volatiles in the coal. It was conceded that the temperature distribution in the calorimeter room was more uniform than would be obtained in an installation but for test purposes in the calorimeter room it seemed necessary to obtain such uniform distribution.

The second technical paper, The Measurement of Smoke, by K. O. Beatty, Jr., and J. E. Deas, Jr., was presented by Professor Beatty (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1950).

Written discussions were received from A. J. Johnson, Landsdowne, Pa., and H. J. Dyktor, Cleveland, Ohio, who could not be present. Discussions were presented by P. R. Achenbach, Washington, D.C., R. C. Cross, Chicago, Ill., E. K. Campbell, Kansas City, Mo., G. V. Parmelee, Cleveland, Ohio, and M. F. Dixon, Toronto, Ont.

Mr. Johnson stated that visual means of measuring smoke were restricted to daylight hours and were not applicable to night hours when air pollution might be serious due to the practice of performing soot burning and soot blowing operations at night. These methods also failed during the evening hours when heating equipment in homes was producing increasing amounts of smoke. He recommended the possibility of requiring the installation of some form of recording smoke meter in all plants where the equipment or fuel had been ruled a potential smoke producer by municipal authorities. While the installation of recording smoke meters would involve expense or inconvenience it was felt that such installation would cost less than some arbitrary conversion of equipment or change in fuel.

Mr. Dyktor stated that in the Division of Air Pollution in the City of Cleveland, the Ringelmann chart had proved satisfactory as a means of determining smoke emission. When violations occur in Cleveland the staff of the Division investigates the fuel, the equipment or the method of operation, because obviously one of these three factors must be unsatisfactory.

Mr. Achenbach stated that the comparison of smoke measurement methods made by the authors was a valuable contribution even though it did not lead to the choice of one method as superior to others.

If smoke is to be removed from the air by filtering methods, then the engineer should be greatly concerned with the properties of smoke that determine how readily it can be separated from the air.

In commenting on the effect of soot or smoke in heating equipment, he stated that at the National Bureau of Standards, a reduction of five percent in the efficiency of an oil fired boiler had been caused by a soot deposit of approximately 1/32 in. on the heating surface.

It was suggested that it might be possible to correlate the physical characteristics of the smoke and the smoke measurements and to determine some relation between the tendency of soot to deposit on heating surfaces and the physical characteristics of the soot. Referring to the difficulty of obtaining a representative sample of flue gases, Mr. Achenbach stated that the *ICHAM* method seemed to be the weakest. It was also questioned whether the smoke deposit on the glass rod was representative

of the sum total of all particles approaching the rod. Since the smoke rod seemed to be installed near a point of change in diameter of smoke pipe, it was possible that the deposit on the rod might be affected by the type of gas flow adjacent to the rod.

Mr. Cross suggested that in some previous work, he had found it possible to correlate photo-electric methods of smoke determination reasonably well with readings obtained by means of the Ringelmann chart.

Mr. Campbell stated that a committee of engineers from the Kansas City Chapter had attempted to assist the local smoke bureau in adding to the smoke ordinance certain provisions regarding fly ash and dust carried by the smoke. This committee found no available information that would be of value even though it concluded that fly ash nuisance in communities where soft coal is burned would probably be as great as that due to smoke.

Mr. Parmelee reviewed difficulties which had been found by the ASHVE Laboratory when attempting to determine smoke density produced by three different fuel oils. He inquired whether the authors had experienced difficulty in obtaining steady readings from the photo-electric device used. The ASHVE Laboratory in its final tests had found the reflectance method of obtaining smoke density to be the most satisfactory.

Mr. Dixon inquired whether the authors had tried to measure white smoke.

Professor Beatty stated that the *ICHAM* method has been used in connection with several different furnace installations and that it had been possible to duplicate results.

The difficulty of obtaining a representative sample had been recognized by the authors and was still being studied.

With reference to Mr. Achenbach's comment on effect of soot, it had been the authors' experience that the stack temperature increased only for a short period during which some soot was deposited and then did not change during the balance of the test period. For this reason tests were not run until the first deposit of soot on the surface had been obtained.

The variation in smoke obtained by the authors had been the result of the use of a variety of oils produced by various processes and was also effected by changes in the fuel burning rate and in the amount of excess air used. Referring to the Ringelmann chart, Professor Beatty stated that no comparison had been made since it was not used in the tests reported. Professor Beatty remarked that the humidity and temperature conditions of outdoor air produced a considerable effect on Ringelmann smoke chart readings and also that the direction of the smoke and its velocity leaving the chimney produced variations in the apparent density.

For this reason it was difficult to obtain a smoke determination within a chimney and predict therefrom the appearance of this smoke when seen at the top of a chimney.

Referring to the position of the pipe in which the photoelectric device was installed Professor Beatty stated that a 60 deg angle had been found to give less difficulty from deposition of soot on the surfaces than had been obtained with a flue pipe in a vertical position.

Referring to Mr. Dixon's comment on measurement of white smoke, Professor Beatty observed that probably all smoke would produce a black deposit and that probably white smoke which contains highly dispersed particles would still cause a large reading in the photoelectric method.

R. C. Cross, chairman of the Committee on Research, presented his report for the year 1950 (see p. 132) and also acknowledged the receipt of a check for $1000 from the *Ventilating and Air Conditioning Contractors Association of Chicago* as a contribution to the research work of the Society. This contribution was recognized by a fine round of applause.

Following the report by Mr. Cross, Cyril Tasker, director of research, gave his report (see p. 134) covering the progress made on various research projects carried on at the Laboratory and at cooperating institutions.

The third technical paper, Rating of Fuel Oils by a Test Unit, by D. W. Locklin and G. V. Parmelee, was presented by Mr. Locklin (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1950).

Written discussions submitted by N. A. Palmer, Bloomington, Ill., E. F. Opperman, Stamford, Conn., and T. H. Smoot, Marshalltown, Ia., were read by Mr. Flink. Discussions from the floor were given by M. F. Dixon, Toronto, Ont., Canada, L. N. Hunter, Johnstown, Pa., F. R. Dunn, Philadelphia, Pa., F. J. Nunlist, Milwaukee, Wis., K. O. Beatty, Raleigh, N. C., and Dean L. E. Seeley, Durham, N. H.

Mr. Palmer inquired whether the introduction of excess air served to reduce smoke or merely to dilute it. He suggested the desirability of designing test equipment which would produce no smoke at the ultimate CO_2 in order that fuels could be classified as substandard if the introduction of excess air did not reduce smoke.

Mr. Opperman suggested that while the proposed method of rating fuel oils had definite possibilities it was probable that the variables encountered in the field were so many that further research would be required before a standard test unit could be designed.

Mr. Smoot stated that although in this particular test unit smoke production increased when the burner ignition was turned off this condition would not apply to all oil burners of the high pressure atomizing type. He felt that the cause of the increased smoke was the change of the flame front to a different position when the ignition was turned off. The test unit did not include means for retaining the flame position independent of the ignition means whereas many burners as manufactured do contain mixing heads which control the location of the flame front, so that no change in position occurs whether the ignition is on or off.

Mr. Smoot also pointed out that the burning qualities of fuels as established by short periods of operation are of great importance because operating cycles of approximately three minutes duration are frequently found in installations where the burner is controlled by heat anticipating thermostats.

Mr. Dixon inquired which method of determining smoke density would be used if the fuels were rated by the fuel test unit. He also asked whether a fuel would be expected to yield the same performance after a period of storage.

Mr. Hunter pointed out that the research work was conducted for the purpose of evaluating the fuel test unit as an instrument of measuring the burning qualities of fuel oil. Such an instrument would be able to determine the burning qualities of fuel oil and serve a purpose similar to that of the engine used in the gasoline industry to measure the anti-knock qualities of gasoline. He stated that the results of the tests which had been sponsored by the *Oil Heat Institute of America* were being considered by a committee of the Institute and that if further work were recommended the ASHVE Laboratory might be asked to conduct further tests.

Mr. Dunn stated that he had followed the work of the authors very carefully in order to coordinate it with his own research in attempting to determine the performance of fuel oils. Mr. Dunn had conducted his investigating by burning the oils in a number of typical burners such as used in homes. One object of his test was to determine the range in oil ratings and oil settings which would be permissible with domestic type burners. Interest was also taken in the problem of finding out how the oil would burn under a wide range of conditions rather than one set of conditions. On the basis of tests run, Mr. Dunn stated that fuel oil specifications had been set up by one company for each of

the typical types of burners, such as high pressure, low pressure, rotary wall flame, and space heating types of burners.

Mr. Dunn stated that the results reported by the authors indicated that most of the oils with the exception of the thermally-cracked oil gave fairly satisfactory performance when the carbon dioxide was less than eleven percent.

Mr. Nunlist inquired why the performance of oil C was inconsistent. Its failure to fall in line might indicate that an index established could not be generally applied to determine interchangeability of fuels. He also stated that perhaps there was a change in power characteristics, speed of the pump or oil delivery rate which affected the smoke when the ignition was turned off and that these factors rather than the lack of ignition had been the cause of the change in smoke produced. It was also suggested that in comparing performance of oils it might be well to maintain the same kinetic energy at the nozzle by changing the nozzle size rather than changing the pressure.

Mr. Nunlist also stated that it would be desirable to know about the origin of all the oils tested in order to know whether the range of available types had been covered.

Professor Beatty noted that in some tests it was necessary to increase the pressure at the nozzle when lighter fuel was used and inquired whether there was some explanation for this required increase in pressure. He also stated that in using a wide variety of oils in the given type burner, he had not been able to obtain as consistent results in regard to smoke production as those obtained by the authors in using the fuel test unit.

Dean Seeley remarked that in a cooperative research project sponsored by the *American Oil Burner Association* and the Society at Yale University the standard operating conditions for oil burners were established at ten percent CO_2 and about fifty percent excess air. The test results given by the authors indicated that beyond ten percent CO_2 smoke difficulty would be expected.

Mr. Locklin, in reply to Mr. Palmer's inquiry, stated that the dilution seemed relatively unimportant and that the reduction of smoke was due to the reduction in unburned carbon.

While tests had been conducted on one type of burner as selected by the *Oil Heat Institute*, it was agreed that the work should be extended to other types of burners.

The author stated in regard to variations in nozzles that variations caused by attempting to clean nozzles were greater than those caused by such deposits as were obtained in the orifice and consequently the nozzles were not taken apart during any of the tests.

The effect of storage upon oil properties was considered to be of considerable importance and therefore many of the oil refineries are at present continuing investigations on this effect.

With reference to Mr. Nunlist's questions about oil C, the author stated that this oil was labeled *refinery scrapings* and that the refiner who sent it did not think it was an oil which would be suitable for an oil burner.

The results due to turning ignition on and off were observed in the tests but no attempt was made to determine what variation might occur in various factors which would influence the flame characteristics.

The author stated that much thought had been given to the matter of the best means of controlling the quantity of oil delivered by the nozzle and that the various factors involved made it difficult to maintain a constant kinetic energy.

The author agreed with Professor Beatty that greater variation in performance would be obtained with burners as found in the field than would be obtained with the fuel test unit.

The fourth paper, Smoke Measurement in a Fuel Oil Test Unit, by D. W. Locklin and G. V. Parmelee, was presented by title only (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, November 1950). Chairman Seeley stated that discussions of this paper should be mailed to Society headquarters and that such discussions together with the paper would be included with the paper when published in the ASHVE TRANSACTIONS.

Chairman Seeley thanked the authors of the three papers presented as well as those who had offered discussions.

The meeting adjourned at 12 noon.

THIRD SESSION, TUESDAY, JANUARY 23, 2:30 P.M.

Second Vice Pres. Ernest Szekely called the meeting to order at 2:30 p.m. in the Ballroom of Convention Hall.

The first paper, A Survey of Electrostatic Precipitation, by E. A. Walker and J. E. Coolidge, was presented by Dr. Walker (see page 107).

G. W. Penney, Pittsburgh, stated that the authors' curve showing precipitator current *vs.* relative humidity could be obtained either with low voltage precipitation in air conditioning, or in high voltage precipitation in industry, but that it applied only to a dust of high resistivity. It was therefore suggested that the curve should be plotted in relation to both relative humidity and electrical resistivity. It was also suggested that a curve should be

A merry group at 57th Annual Meeting in Philadelphia *(front)* Mmes. Frank Merrill, Saul Appel, William M. Wallace, II, W. H. Shipp; Mr. Shipp, Stanley Mathes, Frank Merrill *(back)* C. F. A. Locke, L. S. MacGann, Mrs. MacGann, Saul Appel, V. Dale Wissmiller, Andrew Stewart

(L. to R.) P. R. Achenbach, R. S. Dill, R. K. Thulman, Mrs. James S. Locke, Mrs. C. O. Mackey, Mrs. P. B. Gordon, Mrs. T. H. Urdahl, Mrs. Cummiskey, C. S. Leopold, Mr. Gordon, Carl F. Kayan

shown for clean electrode conditions. Professor Penney felt that more representative results could have been obtained if a small quantity of some other dust had been mixed with the pure gypsum dust.

Ladenburg's theory listed in the authors' Table 1, had been found applicable under the conditions for which it was derived, but did not apply to a special dust such as that used by the authors.

Professor Coolidge stated that gypsum had been selected for dust purpose without any reference to its characteristics as a typical dust. Additional tests are being conducted with other materials, and the factor of resistivity is being given consideration. An attempt will be made to correlate the values for different materials under test conditions with those obtained in operation. The authors had concluded that, after deriving an equation for the precipitation of gypsum based upon voltage, particle size, length of precipitator and velocity of the air stream, it had not been possible to apply Ladenburg's theory to explain the results obtained. None of the theories listed by the authors had been found to fit the measurements made during the tests.

The second technical paper, Theory of Earth Heat Exchangers for the Heat Pump, by L. R. Ingersoll, F. T. Adler, H. J. Plass and A. C. Ingersoll, was presented by Professor L. R. Ingersoll (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, May 1950). Comments were made by G. B. Priester, Baltimore, Md., Merl Baker, Lexington, Ky., W. M. Wallace, II, Durham, N. C., L. F. Deming, Washington, D.C. and J. M. Van Nieukerken, New York, N. Y.

Mr. Priester stated that his associates had found the formulas developed by the authors very useful, and recommended that anyone using the earth as a heat source should review the publications of the authors.

Professor Baker requested the authors to comment on the danger of separation of the soil from the pipes, and the consequent reduction in heat transfer.

Mr. Wallace inquired whether the authors had any experience with pipe using extended surface such as finned type pipe.

Mr. Deming inquired whether the authors had any knowledge of the life of heat pump coils buried in the ground.

Mr. Van Nieukerken referred to the practice of substituting copper pipe for corroded galvanized and iron pipes in gas mains leading into homes. In his experience, no report of failure of copper pipe in such installations had been received.

Referring to Professor Baker's question, the author stated that in one case where a helical coil was used near St. Louis, a separation was obtained between the soil and the pipe. In a number of cases the author had found that a relatively isolated pipe of the hairpin loop type had been found to obtain better performance in the second and third year than it did the first. This condition would indicate that there was separation during the first year, but that it had not continued permanently.

In reply to Mr. Wallace, the author stated that while he had formerly not been in favor of finned pipe, his present feeling was that the increase in surface area provided by the fins was beneficial to the coil.

The third technical paper, Factors Useful in Ground Grid Design for Heat Pumps, by George S. Smith, was presented by the author (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1951).

A written discussion was received from R. C. Chewning, Portland, Ore., and verbal discussions were given by A. K. Fid, Cairo, Egypt, L. R. Ingersoll, Madison, Wis., and G. B. Priester, Baltimore, Md.

Mr. Chewning mentioned that between 1945 and 1949, 112 heat pumps had been installed in Portland and surrounding towns. Of these installations 60 used the ground type of coil, and 28 of them are still in operation, some having been operated for a period of five years.

From a general observation of the operation of the systems mentioned, it had been found that virtually all of the heat pumps installed by one contractor had failed because ground coil design was based upon the amount of metal surface required to transfer heat from the ground to the refrigerant, with an assumed constant ground temperature. One contractor, who has 20 out of 23 installations still in operation, had failed in trying to hold the cost of his installations at a value not exceeding twice that of competitive methods of home heating.

Mr. Chewning pointed out that Professor Smith had demonstrated that many of the formulas and theories in current literature were reasonably correct and usable for determining heat transfer from ground to pipe grids, provided the ground surrounding the pipe did not freeze.

Mr. Chewning agreed with Professor Smith that the ordinary city lot did not provide enough area for supplying heat to the residence which would be built upon it. It was suggested that experiments should be continued to determine the effect of freezing the soil in the vicinity of the coil.

An installation observed by Oregon Chapter's Research Committee had a 38,000 Btu per hour design heat loss. A room temperature of 72-75 F had been maintained for three heating seasons by a coil placed in a ground area of approximately 2000 sq ft. The coil operated at a temperature of approximately 28 F during midwinter, and caused the ground to freeze for a distance of at least a foot from the pipe at the liquid supply end of each pipe in the grid. For frozen ground conditions surrounding a pipe, it was pointed out that transfer of heat to the ground surrounding the coil would continue at a nearly constant rate, even though the compressor were stopped.

Mr. Chewning emphasized the importance of determining the amount of useful heat that would be stored in the ground during the summer in order to determine whether a ground coil installation would be successful.

Mr. Eid inquired whether vertical pipe ground grids would be more important in cities where ground space is small. He also stated that he had found difficulty in ridding the coils of compressor oil, and inquired whether the author could give any suggestion for oil removal.

Professor Ingersoll stated that he was pleased to find some of the results of Professor Smith's experiments to be in agreement with some of his own theories. He also stated that in his experience he had usually found that heat extracted from the soil in winter would be replaced by summer heat, and therefore no auxiliary heating apparatus would be required.

Mr. Priester observed that the tests were conducted for such a short period of time that the author might not be certain of the adequacy of the pipe grid design.

Professor Smith, in reply to Mr. Chewning, stated that the soil was not frozen because the object of the test was to correlate the test data with theory. He felt that freezing of the soil in an installation would be of slight advantage, except in the case of short periods of cold weather when the heat resulting from freezing of the soil would act as a reserve.

The author stated that in certain parts of the country a great deal of heat would be obtained from rainfall. Underground water was cited as a source of heat, in an example quoted by the author. In this case, the location of the ground coil was such that a flow of underground water replaced much of the heat extracted from the soil.

With regard to Mr. Eid's question, the author stated that vertical pipes might be cheaper to install, but that each installation should be calculated for the conditions surrounding it. Professor Smith agreed that the tests were not long enough to determine the adequacy of the coil, but that they were long enough to establish the correlation between heat actually absorbed and the heat absorption calculated by theory.

At the conclusion of Professor Smith's remarks, Mr. Szekely thanked

the authors and those who had discussed the papers.

The meeting was adjourned at 4:45 p.m.

FOURTH SESSION, WEDNESDAY, JANUARY 24, 9:30 A.M.

Pres. Lester T. Avery called the meeting to order at 9:30 a.m. in the Bellevue-Stratford and stated that the purpose of the session was to have a Symposium on the subject, *Man and His Relationship to Air*.

In introducing the subject he referred to the work on physiological reactions in which the Society had been interested since the founding of its laboratory. He mentioned the Effective Temperature Chart and other results of research which were being used as a basis for determining environmental conditions for human beings.

He also referred to the work of the Technical Advisory Committees of the Society, and referred specifically to the Committee on Physiological Research, M. K. Fahnestock, *chairman*; Committee on Sensations of Comfort, C. S. Leopold, *chairman*; and Committee on Human Calorimetry, G. L. Tuve, *chairman*.

President Avery then introduced the moderator of the Symposium, Prof. Nathaniel Glickman, Chicago, Ill. and the speakers who would present different phases of the subject as follows:

Eugene F. DuBois, M.D., New York, N. Y., speaking of *Physiological Aspects of Heating and Ventilating*, said:

It is difficult to establish standards for comfort that cover more than one narrow set of conditions. The factors to be considered are many. Concerning the *human subject*: age, sex, clothing, previous activity, present activity, time of exposure, nationality, habit, acclimatization, etc. Concerning the *room*: dry bulb temperature, humidity, air movement, radiation, etc.

The comfort zone is a relatively narrow band of temperature conditions where the heat loss from the body is most easily regulated to equal the heat production. There is little or no change in the temperature of the body tissue, no sweating, and the skin is about 91.5 F. (33 C). At colder environmental temperatures the blood flow in the periphery is restricted and the skin is transformed from an active heat interchanger into a suit of leather clothing. Since one half of the body mass lies within one inch of the surface there is a large reservoir from which heat can be lost before the temperature of the core of the body is much affected.

Above the comfort zone, as the air temperature gets higher and higher the blood flow in the skin increases rapidly. Sweating increases and finally the only possible channel of heat loss is vaporization.

If a person who has been in a warm room with a high rate of vaporization goes into a cold environment there is a condensation of moisture in the cold layer of clothing. Some of this heat is returned to the body for a short time but later the rate of cooling is increased. When comparing two different environments the time element is important.

Charles S. Leopold, consulting engineer, Philadelphia, Pa., presented a discussion on *The Engineering Aspects of Comfort Data*, including:

(1) The work of the Society in establishing optimum summer and winter conditions for a group by subjective testing. (2) Aspects of the subjective evaluation of comfort. (3) Comfort for an individual as compared with the statistical optimum for a group. (4) His conclusions that the optimum conditions indicated in the Society work, of 75 to 77 F in summer; 73 to 75 F in winter, when the relative humidity is approximately 50 and 30 percent respectively, are adequately substantiated by field experience. (5) The difference between the importance of variables in their effect on comfort when measured as departures from the optimum or from some condition which is too warm or too cool. (6) The importance of horizontal symmetry in radiation, particularly the local effect of hot or cold walls. (7) The absence of a rational relation between desirable indoor and outdoor temperatures from hour to hour. (8) Intolerance for perceptible air motion. (9) The importance of incentive and time within the conditioned space in evaluating the effects of air conditioning.

Theodore F. Hatch, professor of industrial health engineering at University of Pittsburgh, Pittsburgh, Pa., discussing the *Standards for Industrial Heat Control*, said:

The limits of the thermal comfort zone are well established and, similarly, the upper limits of tolerance to acute heat exposures have been fixed, both in the laboratory and in industrial experience. Exposures in the traditional hot industries are now kept generally below this tolerance limit. The ill-effects of heat are so widely appreciated that, even in those industries having no unusual heat production, comfort-conditioning is becoming common.

Between the two limits of comfort and maximum physiological tolerance, however, there exists a considerable region within which many industries must operate — an area which is not well charted in respect to standards for the measurement of heat effects.

Beyond a general desire to reduce heat exposures as much as possible, engineers do not find in this region an adequate, quantitative basis for estimating the benefits which are to be derived from further heat control in comparison with the cost of such improvements. The elementary physiological criteria which serve for measuring acute effects are of limited use in the region of non-acute response. Similarly, the subjective criteria of comfort are of little help when there is no practical possiblity of reducing the thermal environment to this degree. Responsibility for the health and safety of workers is met when the heat level is still high compared with the comfort limit. Below this level the problem is one of balancing the cost of control against the returns, measured in terms of increased efficiency and productivity and improved human relations. The potential benefits vary with the nature of the industry, increasing with the fineness of the work, the manual skills required and with the degree of concentration and mental effort involved.

The area between the comfort zone and the physiological tolerance limit can be divided into three overlapping zones wherein the effects of primary concern may be classed successively as: (1) physiological, (2) psychophysiological and (3) psychological. In industry, the three sub-areas are of corresponding primary interest to these departments: (1) medical, (2) engineering and (3) management (industrial relations). The need exists for thermal physiologists and experimental psychologists to orient their work more toward industry, to provide a quantitative basis for defining and evaluating the varying heat effects and for establishing useful thermal standards between the upper limit of physiological tolerance and the lower limit of simple comfort, where no problem exists.

Robert W. Keeton, M.D., Chicago, Ill., covered the subject of *Air Conditioning in the Treatment and Prevention of Disease*, stating:

Individuals singly and in groups indulge in coughing and sneezing through certain months of the year. Respiratory infections are more prevalent at such times. The inference follows that the infectious agents are airborne and the incidence of disease could be reduced by sterilization of the air. This can be accomplished by ultra-violet radiation and by atomizing triethylene glycol into an atmosphere with a 50 per-

cent RH. Such measures have not significantly reduced the incidence of respiratory disease. Respiratory infections can be spread directly by contact and indirectly by dust which has been formed from droplets coughed onto clothes, bed linens, floors and furniture. A space conditioned for comfort with a 50 to 60 percent RH, free of drafts and unusual sources of cold radiation, furnishes a uniform environment. This does not cause physiologic stress and it does not produce nasal congestion, which may be a factor in initiating head colds.

Anesthesia tends to alter the heat regulating mechanism of the body. In the summer time, when the humidity is high, post-operative patients commonly develop heat retention which, if unrelieved, leads to heat strokes. This causes adrenal stimulation and, if long continued, presumably adrenal exhaustion. A residence of 48 hours in the air conditioned recovery ward avoids such complications. In a study of convalescence it was noted that post-operative patients maintained in comfortable environment made unusually good recoveries. Patients producing extra heat as a result of hyperthyroidism may slip into an hyperthyroid crisis. The latter is prevented or ameliorated by exposure to a cool dry air.

In the waves of hot humid weather patients with heart disease are quite prone to die. The primary difficulty seems to be inability to transport heat to the surface due to circulatory impairment. Heat retention and death follow. This can be prevented by exposure to comfortable or cool dry environments.

In patients with coronary sclerosis, dehydration as the result of excessive sweating may precipitate a blood clot (coronary thrombosis) at the site of an arteriosclerotic plaque.

More recently the reduction to 92 F of the rectal temperature of children with congenital heart disease, who have a limited capacity for oxygenating their blood, has made it possible to operate some seemingly inoperable cases.

Air-conditioned environments are necessary for research studies which include work experiments throughout the year, alterations in circulation, and in the partition and distribution of electrolytes.

Capt. Oscar Schneider, (MC) USN, Washington, D.C., discussed *Problems Following Atomic Blasts* and explained that:

To provide a simplified picture of a broad and complex subject, it is best to regard the casualty-producing effects of an atomic explosion as being largely dependent on its ability to produce mechanical destruction. Thus, in the event of an air burst such as those employed in Japan, it can be expected that most of the fatalities will occur among persons who are injured by the collapse of buildings and houses, and by being unable to escape from the fires which sweep such ruined structures. In a ground surface burst, the area of blast damage will be less than in an air burst, and the number of casualties will therefore be less. In the event of an underwater burst, the damage from blast, as well as from fires will be still less, and so will the number of casualties.

Radioactivity from an atomic explosion is serious, but not by any means serious enough to justify all of the worry it has occasioned. After a blast which has come with no warning, only about 15 percent of those sustaining fatal injuries will die from radiation illness. The remaining 85 percent will be victims of trauma and burns. There is virtually no lingering radioactivity from an air burst. After the first 90 seconds the radiation effects from this type of explosion are no longer a source of danger. Owing to the deposit of fission products and unfissioned atoms of bomb material on the ground or in the water, radiation injuries may form a greater percentage of casualties from a ground or underwater burst, but this percentage can be reduced by an effective Civil Defense Organization. Properly designed ventilation systems in buildings and shelters can also reduce this radioactivity hazard.

The effects of radiation are essentially those due to internal hemorrhage and anemia, complicated by infection. Proper medical care can reduce the mortality rate among the victims with borderline amounts of irradiation as well as those with other serious injuries. Accordingly, the perfection of arrangements for the rescue, first aid, and hospitalization of the injured is of paramount importance in preparation for an atomic war. There is no convincing evidence that atomic radiation will increase the cancer incidence among its victims or even that any noticeable hereditary effects will occur. In Japan the sterility which was observed in many of the injured proved, in all of the cases examined, to be only temporary.

In preparing for an atomic war, individuals can best provide protection for themselves, their families, and their communities by: (1) cooperating in every way with their Civil Defense Organizations; (2) learning the simple rules of taking shelter, of first aid, and of accident-prevention in the home; and, (3) schooling themselves to keep calm in an emergency and to avoid creating a panic.

Each of the speakers presented the subject assigned to him when called upon by Professor Glickman, and after the presentations, an opportunity was given the audience to ask questions or add comments upon the subjects discussed. Presentation of the speakers' remarks with the questions, comments and answers, will be made in a later issue.

In addition to comments made by President Avery, those who took part in the discussion from the floor were, Walter L. Fleisher, New York, N. Y., Dr. D. H. K. Lee, Baltimore, Md., First Vice-Pres. L. E. Seeley, Durham, N. H., W. A. Grant, Syracuse, N. Y., W. F. Wells, Philadelphia, Pa., P. B. Gordon, New York, N. Y., W. C. L. Hemeon, Pittsburgh, Pa., C. M. Ashley, Syracuse, N. Y., I. S. Dane, Boston, Mass.

Mr. Avery thanked Professor Glickman, Dr. DuBois, Dr. Keeton, Mr. Leopold, Professor Hatch and Captain Schneider for their contributions to the session, and also thanked those who had taken part in the discussion.

The meeting was adjourned at 12:30 p.m.

FIFTH SESSION, WEDNESDAY AFTERNOON, JANUARY 24, 2:30 P.M.

Vice-Pres. L. E. Seeley called the meeting to order at 2:30 p.m. in Convention Hall, and introduced L. F. Schutrum who presented a paper, based on field studies conducted by the ASHVE Research Laboratory entitled, Field Studies of Heat Losses from Concrete Floor Panels, by C. M. Humphreys, C. V. Franks and L. F. Schutrum (paper published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1951).

M. J. Gibbons, Jr., Dayton, Ohio, asked the authors whether they had found the most suitable type of insulation for use at the edge of floor panels.

Mr. Schutrum stated that no attempt had been made to determine the best insulation, but it was planned to continue the tests for the purpose of obtaining further data.

The second paper, Principles of Effective Heat for Steam Heated Structures, by C. O. Mackey, N. R. Gay, R. D. Tutt, E. G. Powell and E. L. Broderick, was presented by Professor Mackey (published in ASHVE JOURNAL SECTION, *Heating,*

Texans meet in Philadelphia — Mrs. Reg F. Taylor, C. Rollins Gardner (Dallas), Mr. Taylor (Houston)

Piping & Air Conditioning, January 1951).

Prepared discussions of the paper were presented by W. S. Harris, Urbana, Ill., R. S. Dill, Washington, D. C., H. W. Williams and R. H. Weigel, Johnstown, Pa., M. W. McRae, Chicago, Ill., P. R. Achenbach, Washington, D. C., M. K. Fahnestock, Urbana, Ill. Discussions from the floor were also given by R. K. Thulman, Washington, and R. W. Morgan, Buffalo, N. Y., and written discussion was received from R. N. Trane, LaCrosse, Wis.

Professor Harris asked three questions: (1) Was insulation used in the wall behind the baseboard units? (2) Were any tests conducted with insulation applied to the cold room walls? (3) Did not the method of introducing air lower the surface temperature of the wall below that normally expected?

He felt that the choice of a 32-in. high radiator was not advisable since the most common height of radiator sold during the past five years has a height of 25 in.

It was also questioned whether the values obtained under test conditions would apply under normal operating conditions.

It was recommended that any value placed on effective heat should take into account effects of radiation, and not depend entirely upon dry-bulb temperature readings. Tests conducted at the University of Illinois were quoted to support this last comment.

Professor Harris concluded that the term *effective heat* was really a usage factor which is more dependent upon the structure, the method of installation, and the method of operation than it is upon the design of the heating unit, and therefore it should not be based on unit design.

Mr. Dill stated that the purpose of rating any type of heating equipment is to furnish engineers with information which will enable an engineer to select equipment of the proper capacity to fit the heating requirements of the space to be served. He felt that the concept of heating effect is illogical since it ascribes a rating to a device greater than its capacity. If a heating device were responsible for heat loss due to bad temperature distribution, then it would be more proper to assign an efficiency less than unity instead of applying a credit obtained by comparison with another device which is considered inferior.

It was also felt that the characteristics of the test room and the unit selected for comparison created a condition favorable for the convectors tested.

It was also noted that the use of a slot around a window for introducing air was not a conventional method of introducing air into a room, and might account in part for the problems encountered.

In conclusion Mr. Dill recommended that the purpose of ratings for heating systems or devices should be to permit selection of capacities to fit requirements, and that no heating device should have a rating greater than the observed capacity.

Mr. Weigel pointed out that the 32 in. high radiator should not have been selected as a standard because 60 percent of all cast-iron radiators sold since 1945 were 25 in. in height, and only 5 to 11 percent were of the 32 in. height.

An analysis by Williams and Weigel indicated that if a 19-in. radiator had been used as a standard, no effective heat percentages would be added to convectors having the top of the discharge grille over 27 in. high.

These discussers also felt that a comparison should not be based on dry-bulb temperature alone, and thereby disregard radiation effects from surrounding surfaces. It was suggested that since long, low heating units are at a disadvantage in regard to steam consumption, unless proper insulation is applied on the back, insulation should have been used in the exposed walls. It was also thought possible that results would have been different if the steam had been supplied intermittently in accord with operating practice.

Mr. McRae asked why any type of cast-iron radiator should be used as a standard in determining convector performance. It would seem equally logical to determine heating effect for radiators by comparing their performance with that of a convector having a 32-in. high top outlet. If a comparison between radiators and convectors were to be made, then it would be logical to select units of approximately the same overall dimensions.

P. R. Achenbach felt that the selection of a 32-in. high radiator for comparison with convectors, the testing of the units being compared in different locations, and also the possibility that the slot around the window might affect the performance of units under the window, constituted reasons for questioning the suitability of some of the test conditions. It was also felt that an air temperature thermocouple at the center of the room was not a suitable device for determining relative performance of two units, one of which delivers most of its heat by convection, and the other nearly half of its heat by radiation. A globe thermometer or other instrument sensitive to radiation and convection should constitute a better index instrument.

It was concluded that the scope of the tests would need to be broadened considerably before general conclusions about heating effect could be accurately stated.

Professor Fahnestock stated that no laboratory rating shoud be contingent upon the physical test setup, or widely different from the rating or performance which would be obtained in most heating installations. He pointed out that Commercial Standard, CS140-47, Testing and Rating Convectors, which is mentioned in the paper, permits testing of convectors in three widely different test rooms, namely, the warm wall booth, the cooled wall room, and the cold room.

It was pointed out that this government Commercial Standard applies only to the testing and rating of convectors, and not to the testing and rating of radiators and baseboards. The same Commercial Standard includes a table of arbitrarily selected percentages which may be added to the heat capacities determined by test in order to arrive at ratings of

certain types or heights of convectors. It does not provide for measuring or determining them.

Professor Fahnestock felt that the free-standing radiator should have been tested in the position under the window used in testing 14 of the 17 convectors. It was also noted that it is well recognized in practice that heating units should be located under windows.

It was agreed that the test data demonstrated that many factors affect the performance of various heating units. The units and conditions selected, however, while convenient for the purposes of study, did not seem to conform sufficiently to current practice. It was therefore suggested that additional tests be conducted using a small tube radiator 19 or 25 in. high, located under the exposed window, and that the index point be selected as 30 in. above the floor in the center of the room. It was also suggested that in making comparisons some evaluation of comfort conditions should be made.

Mr. Thulman stated that he continued to object to the use of a heating effect or effective heat factor, even though such an allowance had been included in the government Commercial Standard 140-47. He felt that other choices of a standard unit, index point, location of the reference radiator, method of measuring temperature, design and construction of the test room, location of windows and other factors would have produced entirely different results. He felt that the conclusions of the paper should not be accepted, and recommended that additional tests be run under conditions more representative of common heating practice.

Mr. Morgan pointed out that although the tests had resulted in establishing a factor, it was not clear just what that factor would mean, or that it would be useful under application conditions of convectors. He stated that he objected to the use of an effective heat factor to be applied in raising the rating of a unit above the actual heat output.

Mr. Trane suggested that the approach used by the authors was a new one, and that while the selection of the heating unit used as a standard might cause some controversy, this item did not seem to be of too great importance. He did note that the results of the tests seemed to match the heating effect percentages published in Commercial Standard CS140-47.

He also noted that in the case of the baseboard convector the advantage in heating effect was apparently obtained solely because of improved floor to ceiling temperature gradients.

It was suggested that further tests be conducted, utilizing hot water as the heating medium.

Professor Mackey thanked all those who had shown so much interest in the paper. He stated that the subject of effective heat had been a controversial one for some time, and consequently the authors did not expect to resolve the controversy by this one set of tests. Since many of the discussers had mentioned the same objections, he preferred to discuss the objections rather than to answer each discusser.

It was pointed out that globe thermometers were placed at the 12-in. level and at the 48-in. level at the center of the test room, and that readings of these thermometers were included in the test results presented. Operative temperatures representing the average of the dry-bulb temperature and the mean radiant temperature, if used as an index, could therefore be determined and a comparison could be made of the effective heat based on air temperature at the 48-in. level and the effective heat based on globe temperature at the same level. Such comparisons were made by Professor Mackey, and it was found that effective heat at the 48-in. level was about the same whether based on air temperature or operative temperature.

It was agreed that the selection of a 32-in. radiator as the standard unit for comparison was arbitrary, and it was for this reason that tests of the 19-in. high radiator had been included. The use of insulation behind the heating units had been considered, but since the type and amount of insulation could not be considered as an established standard, it was concluded that tests should be run for the purpose of determining comparative performance in the available test structure.

Intermittent supply of steam would undoubtedly produce different comparative results, but equilibrium conditions were selected for comparison purposes in accordance with customary practice in making such tests.

The third paper, Transportation Heating and Air Conditioning Systems and Controls, was presented by the author, N. O. Kirkby (to be published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, April 1951).

Vice-President Seeley announced that the fourth paper would be presented by title only. This paper was, Water-Vapor Permeability of Building Papers and Other Sheet Materials, by E. R. Bell, M. G. Seidl and N. T. Krueger (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1950).

The chairman announced that additional discussions received would be included with the papers published in the ASHVE TRANSACTIONS 1951.

The meeting was adjourned at 4:35 p.m.

SIXTH SESSION, THURSDAY, JANUARY 25, 9:30 A. M.

Treasurer Reg F. Taylor called the final technical session to order in The Bellevue-Stratford at 9:30 a.m.

The first paper, Use of Aircraft Propellers for Axial Flow Fans, by E. C. Lundquist and M. J. Hamilton, was presented by Professor Lundquist (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1950). A. E. Criqui, Buffalo, had submitted a written discussion which was read by Mr. Flink.

Mr. Criqui pointed out that for low pressure coefficient fans, such as discussed by the authors, the difference between static and total pressure was an unimportant factor, and velocity pressure could be used in plotting fan performance data in dimensionless form. If fans having different outlet sizes were to be compared, the performance should be that resulting after transforming the outlet area to the duct area. Such conditions did not appear in the paper because the fan size and duct size were always identical.

Mr. Criqui also stated that for the second determination of fan size, it is useful to use the relation of the pressure and velocity coefficients to the diameter. These relations are:

C_{pt} varies as $1/D^4$

V/n^p varies as $1/D^q$

The effect of size change could then be plotted across the chart, and be helpful in determining a new diameter.

Chairman Taylor announced that additional discussions could be mailed to the ASHVE Headquarters.

The second technical paper, Roof Spray for Reduction in Transmitted Solar Radiation, by G. E. Sutton (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1950) was presented by the author. Discussions from the floor were given by G. V. Parmelee, Cleveland, Ohio, F. E. Ince, St. Louis, Mo., and A. S. Haron, Maywood, Ill.

Mr. Parmelee asked the author to state whether solar radiation had been found to have the greatest intensity on days having the highest dry-bulb temperature. In Cleveland it had been found that solar radiation intensity was lower on days having a high dry-bulb temperature when also the dewpoint would be high.

Mr. Parmelee also asked whether data had been collected on the life of roofs

as affected by insulation under the roof due to the increased roof temperature caused by the insulation. The comment was also made that radiation from a roof is not dependent upon the direct difference between the roof and outdoor air temperature. In tests at the ASHVE Research Laboratory it had been found that the sky does not act as a black body radiator at air temperature, but that radiation received from the sky is dependent upon air temperature, and is also dependent upon dewpoint temperature. The radiation received may be from 60-80 percent of the radiation emitted by a black body radiating at air temperature.

Mr. Ince inquired whether wind velocities had been determined in tests, and whether the wind had an effect on the windage loss from the spray.

Mr. Haron inquired whether the relative humidity of the air had an effect on the cooling obtained by the spray.

Mr. Sutton, referring to Mr. Parmelee's question, stated that the maximum solar radiation occurs immediately after a thunder storm when the air is clear, and that maximum solar radiation does not occur simultaneously with maximum dry-bulb temperature.

No measurements had been made of wind velocities, but the authors had attempted to control the sprays so that there would be minimum losses due to wind. Wind velocities during tests seldom exceeded 3 mph. In these tests relative humidity had not been given consideration. The author stated that no investigation had been made to determine the life of insulated roofs.

The third paper, Solar Energy Transmittance of Figured Rolled Glass, by G. V. Parmelee and W. W. Aubele, was presented by Mr. Parmelee (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, February 1951). Discussions were presented by E. W. Conover, Detroit, Mich. and E. B. Penrod, Lexington, Ky. Professor Penrod's discussion was read by Merl Baker, Lexington, Ky.

Mr. Conover suggested that glass temperatures should be shown because the glass temperature enters into the heat loss during daylight hours in winter, as well as during cooling hours in summer. It was also suggested that more information should be given to describe the characteristics of the glasses tested in order that certain differences in the results could be accounted for. It seemed reasonable that due to the greater surface area obtained with configurated glass, heat transmission factors would be higher than for clear glass.

Professor Penrod had inquired whether the reduction in direct heat transmission due to surface configuration was due to increased absorption or increased reflection. If absorption were increased, then an appreciable amount would ultimately be transferred to the inside air by conduction and convection, thereby counteracting the advantage obtained by reduced transmission. It was also suggested that the technique used to measure the different heat components would be desirable.

Cyril Tasker, Director of Research, reviewed the ASHVE Program on Heat Flow through Glass, for the last six years. He mentioned that the short range program dealt with forced convection heat transfer coefficients, and resulted in the publication of the Research Bulletin, Forced Convection Heat Transfer from Flat Surfaces, by G. V. Parmelee and R. G. Huebscher, Vol. 53, No. 3 (published in November 1947).

The long range program covering solar radiation transmission had resulted in the publication of several papers and a RESEARCH BULLETIN, Heat Transmission Through Glass, by G. V. Parmelee, Vol. 53, No. 1 (published in July 1947).

Practical application of the research results had been prepared by Mr. Parmelee for the chapter on Cooling Load for the 1951 edition of the HEATING, VENTILATING, AIR CONDITIONING GUIDE.

Mr. Tasker stated that plans were underway for translating all of the data gathered into practical form for use in computing cooling loads.

Mr. Parmelee stated that data for a Bulletin were now in preparation and would include such information as requested by Mr. Conover. The author agreed with Mr. Conover that the surface area due to configuration of glass had an important effect on heat transmission. In calculating solar absorption, therefore, credit had been given for configuration by increasing the emissivity to some extent. This same type of allowance had been made for ribbed glass block.

Mr. Parmelee stated that careful consideration had already been given to determine the absorption of heat by the glass, and that data relating to this absorption would be presented in a Bulletin.

In the Research Laboratory tests, diffused transmittance had been obtained by exposing the pyrheliometer to the sky in a shaded position. Factors were then applied to get the direct transmittance from other tests.

Installation of Officers

Chairman Taylor then turned the meeting over to President Avery who stated that he was about to become a Past-President, and exhibited the Past-President's Emblem which had been presented to him at the Banquet. He expressed his appreciation of the fine work which had been done by the various Committees of the Society, such as Admission and Advancement, L. S. Ries, chairman, which had handled over 1100 applications; Publication Committee, S. S. Sanford, chairman, which had examined and approved all of the meeting papers; the Guide Committee, A. B. Algren, chairman, which had prepared the Technical Data Section for the 1951 edition of THE GUIDE; the Research Committee, R. C. Cross, chairman, and the Public Relations Committee, C. E. Price, chairman.

He also paid tribute to the work of the staff of Headquarters office, and mentioned that A. V. Hutchinson, executive secretary, had been with the Society 29 years, and had just passed his 25th Anniversary as secretary, and that Dorothy M. Mildner and Harriet E. Babcock had also served 25 years.

President Avery then expressed the appreciation of the Society for the work which had been done by the members retiring from the Council, A. E. Stacey, Jr., D. M. Allen, F. A. Hamlet, C. S. Leopold and H. E. Sproull.

In preparing to install the newly elected officers, President Avery called the new members of the Council to the rostrum and introduced John H. Fox, L. N. Hunter and B. H. Spurlock, Jr., who were present, and announced that Neil H. Peterson could not attend.

The new treasurer, Howard E. Sproull, Second Vice President Reg F. Taylor, First Vice President Ernest Szekely, and President L. E. Seeley then took their places on the rostrum.

President Avery handed the gavel to President-Elect Seeley, stating as he did so that in the hands of the new officers he felt certain that the Society would do greater things in the future than it had in the past.

Dean Seeley accepted the gavel and made the following brief speech:

Gentlemen, in assuming this new office, which gives me great pleasure, and I am sure I may speak for the rest of you, I would like to briefly point out that we have come through a very exciting and fruitful year of effort. The Society is in flourishing condition. The membership is increasing. A year ago we adopted new By-Laws. I may tell you that some of the troubles this year were not caused necessarily by the new By-Laws, but caused us

to be a little more careful to study them and to learn them so that we might run the Society effectively. It will take a little time to become adjusted to such matters, and the process will continue in order to complete the organizational procedures that will be necessary for, we hope, a long time in the future.

I hope the constructive work will continue. I hope that I will justify your confidence in electing me to this office. I make no rash promises, but I will do the best I can.

President Seeley called on S. W. Beaty, Chairman of the Resolutions Committee, who presented the following Resolutions, which he moved for adoption. The motion was seconded by Past Pres. Lester T. Avery, and adopted unanimously.

Resolutions

WHEREAS: The 57th Annual Meeting of the ASHVE, January 22-23, 1951, has attained new highs in accomplishments both technically and socially, therefore, BE IT RESOLVED THAT WE:

1. Wholeheartedly recognize and express our appreciation for the cooperation of the National Officers and Staff, the Philadelphia Chapter and the efficient committees of the Committee on Arrangements which actuated careful planning into accomplished fact insuring the profit and pleasure which have highlighted this meeting.

2. Thank particularly the many members of the Philadelphia Chapter whose various personnel assisted in registration, meetings and the Exposition, the Philadelphia Convention and Visitors Bureau for its assistance in providing the housing bureau and the Hotels whose management cooperated in furnishing such excellent service and facilities for social functions.

3. Thank the authors of papers and speakers who have devoted so much time to their preparation of data and their informative presentations of new progress in the arts of heating, ventilating and air conditioning, and also commend Dr. Lillian Gilbreth and Cameron Ralston for their inspiring messages.

4. Also express appreciation to the daily newspapers and the technical press for their part in reporting the meeting to the public and the profession; and compliment the manufacturers who exhibited at the Exposition in the Commercial Museum for their excellent displays, and the managers and their staff.

5. Express particular gratitude for the gracious entertainment thoroughly enjoyed by our visiting ladies which brought to us the happy discovery that the slogan, "The City of Brotherly Love" expresses only half of it and should be amended to read "The City of Brotherly and Sisterly Love."

Respectfully Submitted,

THE RESOLUTIONS COMMITTEE
S. W. Beaty, *Chairman*, Shreveport, La.
I. W. Cotton, Indianapolis, Ind.
R. C. Chewning, Portland, Ore.

As there was no further business, President Seeley declared the 57th Annual Meeting of the Society adjourned at 11:15 a.m.

For the illustrations throughout the Proceedings we are indebted to William Wallace, II, Durham, N. H.

HONORED FOR 25 YEARS SERVICE AS ASHVE SECRETARY

A BRONZE plaque "in recognition of 25 years of loyal service" was presented to A. V. Hutchinson, executive secretary of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS on behalf of the ASHVE, at the 57th Annual Banquet of the Society at the Bellevue-Stratford, Philadelphia, January 24, 1951. The presentation was made by Lauren E. Seeley, president-elect of the Society, who is dean of the College of Technology, University of New Hampshire.

In his citation to commemorate Mr. Hutchinson's 25 years of service, as secretary of ASHVE, Dean Seeley said:

We have recently been reading and hearing a great deal about the mid-century, its problems and its achievements. Now we are actually starting the second lap and nobody knows what the year 2000 will bring. It is a natural thing to talk in terms of centuries in the history of mankind but it is much more appropriate and understandable to talk in terms of decades when living men are concerned.

Twenty-five years (2½ decades) I'm sure does not seem like such a long time to many of us in retrospect. That would be particularly true of those who live busy, useful and fruitful lives. Our measure is in deed rather than in time itself. And it is in these terms that we can best honor a man who has been the one constant, and constructive element in this great Society of ours for twenty-five years. A few of us know some of the complexities of an organization like this. Many of us serve it voluntarily in its manifold activities. It is however a hard simple fact which we should recall tonight and that is, that an organization, no matter how fine it looks on paper, needs a nucleus of management that must be faithful, skillful and wholly devoted to it while we serve only part time.

It is no simple task for a man to be the servant of so many of us, over 8000 members, with a multiplicity of ideas and opinions. There are two things I think that have kept us one of the happiest, friendliest and most useful of engineering societies anywhere in the world. First is the utter and complete devotion of one man whose efficiency, skill, and capacity for hard work produces the smooth operation which is the proof of good management. Second is ourselves. As Americans, we understand and practice the give and take which lies at the heart of a democratic society. With that is a capacity for gratitude which makes occasions of this sort so heartwarming to all of us.

A. V. Hutchinson ("Hutch" to us), I suppose you are completely unaware of the fact that I have been talking about you. You are the Executive Secretary of this organization, the man who is responsible for keeping the wheels in motion and the bearings oiled. You work in such a self-effacing and modest manner that the art of management expresses itself only in terms of service to others.

Tonight while the honor is yours, the pride is ours in presenting to you this plaque as evidence of our appreciation of your loyal services to the Society for twenty-five years. While we can and will emphasize this gratitude of ours still further, the simple fact remains that it is that precious loyalty that we admire and with it we feel that the ASHVE can go forward with you in solid confidence to greater goals of public and professional service.

1950 Annual Report Committee on Research

R. C. Cross, Chairman

R. C. Cross, *Chairman*
Committee on Research

R. S. Dill, *Vice Chairman*
Committee on Research

It is a pleasure, and a privilege to have this opportunity to present to the members of the Society a report of the Committee on Research for the past year of operation. Our Society is unique, as you all know, in the respect that it is the only professional Society which supports its own Research Laboratory, and the research program very properly should be of interest to each and every member of the Society. It is the proportionate allotment of membership dues that supports the research program to a large part and because of this, the Committee on Research feels that it has a very definite obligation to the members as well as to the Society in general and to the art of heating, ventilating, and air conditioning.

Consistent with the general development of the industry and the increasing membership of the Society, it might be well to point out the status of the research expenditures for the past decade (Fig. 1). A review of the dollar volume for research expenditures for these years shows a consistent increase from a low of approximately $32,000 in 1942 to last year's figure of $160,000.

As further demonstration of the growth of the program, your attention is called to the increase in projects over the past 10 years (Fig. 2) which shows an increase from a low of 13 projects in 1943 to 35 projects in 1950. It should be noted, also, that the laboratory staff has increased from a low of 5 members to its present complement of 25 persons. These data are presented as a general review of progress during the past 10 years, and would indicate a normal, healthy growth.

During the year 1950, the research program has been actively coordinated by 19 Technical Advisory Committees. Twenty-five Technical Advisory Committee meetings were held during the year with 189 members present, and 120 visitors attending. The Committee on Research held three meetings with 42 members and six visitors in attendance. Three meetings of the Research Executive Committee were held. All of this activity is indicative of the interest and enthusiasm of the members of these committees, and when one considers the fact that the services of these men are purely voluntary, it is the debt of the general membership to these groups which must be gratefully acknowledged.

The following projects were completed at the Research Laboratory during the year 1950.

1. Measurements of heat flow through unshaded sunlit glass.
2. Development of design heat flow data, including over-all coefficients, for unshaded sunlit glass for three latitudes and one season.
3. Revision of Guide Chapter on Cooling Load to include above data.
4. Investigation of convection conductances for a flat surface exposed to the natural wind.
5. Development of new psychrometric chart and its inclusion in The Guide 1951.
6. Development of simple heated thermocouple anemometer.
7. Survey and analysis of available information on energy losses in 90 deg duct elbows.
8. Revision of The Guide Chapter on Air Duct Design to include data from above.
9. Field studies of heat losses from concrete floor panels.
10. Laboratory studies of the thermal characteristics of four plaster panels.
11. Studies, by electrolytic analogue, of heat flow through a concrete slab on earth with tubes tangent to the slab-earth interface.
12. Investigation of the Combustion Reference Test Unit as a means of rating fuel oils (in cooperation with the *Oil-Heat Institute*).
13. Measurement of fuel oil smoke density as part of the instrumentation for the Combustion Reference Test Unit.

In addition, two cooperative projects were completed:

Case Institute of Technology—Comparative study of ventilating jets from various types of outlets.
Columbia University—Electric Analogger studies on panels with imbedded tubes.

At the present time, there are 23 projects in progress at the Laboratory related to the following fields of interest:

Solar Heat Gain and Shading Effects

1. Investigation of variation of diffuse solar radiation incident upon variously oriented vertical surfaces.
2. Relationship of direct and diffuse irradiation of horizontal surfaces and solar altitude.
3. Analytical and experimental investigation of the effects of various types of sunshades on heat flow through sunlit glass.
4. Film coefficients for low air velocities.
5. Studies with a convection-compensated radiometer.
6. Preparation of bulletin summarizing research on heat flow through glass.

Panel Heating and Cooling

7. Electrolytic analogue studies of concrete panels.
8. Field studies of heat losses from concrete floor panels.
9. Field studies of heat flow from plaster panels.
10. Completion of calorimeter room and installation of equipment.
11. Development and construction of special instrumentation for calorimeter room.
12. Study of the nature and quantitative value of heat exchange from a floor or ceiling panel with temperature of all other surfaces controlled.

Air Distribution

13. Completion of literature survey on the fundamentals of ventilation jet behavior.
14. Study of isothermal jets discharging into a large space.
15. Investigation of turbulence in isothermal air movement.
16. Development of turbulence intensity indicator.
17. Development of probe for remotely establishing direction of air velocity.

Air Cleaning

18. Study of factors influencing development of standard methods for testing air cleaning devices.

Odors

19. Planning of odor-free test rooms and development of program for study of relationship of principal physical characteristics of air to development and perception of odors of varying types and levels.

Cooling Load

20. Development of thermal circuit diagram to give schematic representation of factors that influence the instantaneous load in an air conditioning system.

Heating Load

21. Completion of apparatus for measurement of infiltration or air change by tracer gas technique.

Sorbents

22. Field studies to check applicability of proposed method for testing sorption-type dehumidifiers.

Human Calorimetry (ONR Contract)

23. Continuation of assembly, construction and instrumentation of component parts of human calorimeter and auxiliary equipment.

It has been a practice for some years for the Society to round out the research program beyond the limitations of the Research Laboratory by the conduct of research projects in cooperation with institutions of learning. It is felt that this is a healthy program, and the Committee on Research for the past year has attempted to strike a balance between the work in progress at Cleveland and that being conducted elsewhere. There are nine cooperative projects now under way. The institutions and the projects are shown elsewhere in this report.

Presented at the 57th Annual Meeting of The American Society of Heating and Ventilating Engineers, Philadelphia, Pa., January 1951.

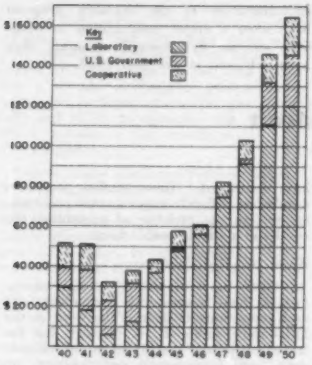


Fig. 1—Research Expenditures 1940 to 1950

The policy of carrying on certain projects by means of Society sponsored fellowships at Universities has been reactivated during the past year to a certain extent. At the moment, fellowships have been established at the University of Minnesota and at Pennsylvania State College. In addition, negotiations are under way which probably will lead to the establishment of several additional fellowships.

Consistent with the expansion of the program and the normal growth of the Laboratory, there have been significant additions to the Laboratory equipment in Cleveland. Those who have had the opportunity to visit the Laboratory during the past year have seen this in detail, but I would point out several of the more outstanding additions that have been made.

One of the most useful and valuable additions to the facilities is the new calorimeter room, which is well under way and will be available for active use within the near future. Essentially this is a room 25 ft × 12 ft with an adjustable ceiling in heights up to 12 ft. The room, with auxiliary equipment, consisting of compressors, a silica gel dehumidifier, heat exchangers, and accessory equipment and instrumentation will represent an investment of approximately $50,000. The Society is profoundly grateful to many friends in industry for donations of equipment or for providing equipment at favorable prices with prompt delivery, which expedited the building of this facility.

Another item of considerable interest and value to the program is the human calorimeter which has been constructed in connection with the program for the Office of Naval Research.

In addition to the supervision of the research program during the past year, fund raising activities and research promotion efforts have been carried out by the Director of Research. Although no special appeals have been made and booklets issued as in previous years, the Director's efforts resulted in total industry contributions for the fiscal year amounting to approximately $53,000. I should like to take this opportunity to especially acknowledge this fine work by Mr. Tasker.

Although not directly a part of the 1950 research program, it should be of interest to the members to learn that, after considerable discussion of possible methods of raising funds for research, a special committee of Council, a Ways and Means Committee, has been appointed. This committee will assume the responsibility of fund raising under the general guidance of the Finance Committee of Council.

Considerable effort was expended during the fiscal year 1950 by the Committee on Research, and particularly by a subcommittee headed by I. W. Cotton, on the formulation of a long-range research program. The establishment of such a program is essential for presentation to the group assigned the responsibility of raising funds for research. It seems reasonable to presume that in order to raise funds for research properly, a well planned program must be presented to prospective donors. The Society should not raise money for blue sky research, or do research on a wholesale basis merely for the sake of so doing. We should ever keep in mind our obligation to the membership, to industry, and to the art of maintaining the highest quality in the research program, and keep within the bounds of a carefully planned and balanced program.

Year	ASHVE LABORATORY			COOPERATING INSTITUTIONS	
	Society Projects	New Projects	Staff	Number	Projects
Pittsburgh					
1940	5	3	7	13	17
1941	5	1	8	13	18
1942	2	1	8	15	19
1943	2	1	9	8	10
Cleveland					
1944	3	—	9	8	15
1945	9	—	10	9	13
1946	12	—	14	9	11
1947	12	—	15	6	8
1948	12	1	24	6	8
1949	15	1	24	6	9
1950	23	1	25	9	11

Fig. 2—ASHVE Research Program

The critical international situation that confronts us today has already shown indications of its possible effects on both the staff and the program. The services of the Society's research staff were made available to, and used by the nation in World War II. It is hoped that there will be opportunities to put our particular skills and knowledge to use for the common good once again. Until the call comes, most of the program is going ahead as planned, with particular attention to those parts that seem to be most important, considered in light of the Society's long-term needs.

It has been the practice in the past, and this report may be considered representative, for the Committee on Research to report officially to the members at the Annual Meeting of the Society. Some thought is being given to the desirability of more frequent reports of the status of the program, possibly through the Society JOURNAL.

In 1949 the membership was polled as to its interests and desires for projects to be considered in the research program. This information has been most helpful in guiding the deliberations of the Committee on Research for the past two years. It may be desirable that this be done at periodic intervals in order that the reaction of the members to the program itself, and to advances in the art may come to the Committee on Research without undue delay. This matter, likewise, is being considered.

The solicitation of your ideas merely substantiates the belief that this is *your* Society, and this is *your* program supported by *your* money. It has been the aim of the Committee on Research during the past year to meet your ideas to the best of its ability.

In closing, I would be most ungrateful indeed if I did not pay tribute to the other members of the Committee on Research and to the numerous members of the Technical Advisory Committees, who

RESEARCH PAPERS — 1950

1. Laboratory Studies on Heat Flow Within a Concrete Panel, by C. M. Humphreys, H. B. Nottage, C. V. Franks, R. G. Huebscher, D. W. Locklin and L. F. Schutrum (Cleveland, Ohio) (April 1950, JOURNAL SECTION).

2. Heat Flow Analysis in Panel Heating or Cooling Sections, by L. E. Hulbert, H. B. Nottage, and C. V. Franks (Cleveland, Ohio) (April 1950, JOURNAL SECTION).

3. Electric Analogger Studies on Panels with Imbedded Tubes, by Carl F. Kayan (New York, N.Y.) (May 1950, JOURNAL SECTION)*.

4. A Simple Heated-Thermocouple Anemometer, by H. B. Nottage (Cleveland, Ohio) (September 1950, JOURNAL SECTION).

5. Heat Flow Through Unshaded Glass, by G. V. Parmelee and W. W. Aubele (Cleveland, Ohio) (June 1950, JOURNAL SECTION).

6. A Proposed Psychrometric Chart, by H. B. Nottage (Cleveland, Ohio) (July 1950, JOURNAL SECTION).

7. Comparative Study of Ventilating Jets from Various Types of Outlets, by Alfred Koestel, Philip Hermann, and G. L. Tuve (Cleveland, Ohio) (July 1950, JOURNAL SECTION)*.

8. Energy Losses in 90-Degree Duct Elbows, by D. W. Locklin (Cleveland, Ohio) (September 1950, JOURNAL SECTION).

9. Effective Solar Absorption of Various Colored Paints, by R. H. Heilman and R. W. Ortmiller (Pittsburgh, Pa.) (June 1950, JOURNAL SECTION).*

10. Smoke Measurement in a Fuel Oil Test Unit, by D. W. Locklin and G. V. Parmelee (Cleveland, Ohio) (November 1950, JOURNAL SECTION).

11. Rating of Fuel Oils by a Test Unit, by D. W. Locklin and G. V. Parmelee (Cleveland, Ohio) (December 1950, JOURNAL SECTION).

12. Field Studies of Heat Losses from Concrete Floor Panels, by C. M. Humphreys, C. V. Franks, and L. F. Schutrum (Cleveland, Ohio) (January 1951, JOURNAL SECTION).

13. Solar Energy Transmittance of Figured Rolled Glass, by G. V. Parmelee and W. W. Aubele (Cleveland, Ohio) (February 1951, JOURNAL SECTION).

*Prepared in cooperation with the TAC on Cooling Load and the ASHVE Research Laboratory.

have given so untiringly of their time and effort in the past year's program. Their invaluable contribution is deeply and gratefully acknowledged.

Finally, I wish to pay tribute to Cyril Tasker, our director of research, whose real enthusiasm, sincere purpose, and infinite grasp of the situations arising in the administration of the research program have been a major contribution to whatever success the research program may have achieved in the year 1950.

Report of the Director of Research

By Cyril Tasker

THE chairman has reviewed the rate of progress of the Society's research program for the past decade, has outlined the program carried on during 1950, and briefly described the studies currently under way. This report will attempt to fill in some of the details for the different parts of the program.

The year 1950 has been marked by continual activity. For most of the year, more projects have been on the program than there was competent staff in Cleveland to attack them as rapidly as desired, or qualified institutions able and willing to assist in solving some of the problems. The Research Laboratory Staff has striven to maintain the quality of the program and to resist the temptation to replace quality with quantity; a temptation that faces every research organization when it is under pressure to produce needed information.

The record for 1950 should not be measured only by the papers presented at the 1950 Semi-Annual Meeting and at the 57th Annual Meeting. The results of much of the work carried on during the year will come to light when THE GUIDE 1951 is published and in additional papers, some of which are now being prepared for publication.

Equipment

The growing dollar value of our inventory of apparatus and equipment as shown in the financial report of the Society is but a poor yardstick by which to evaluate it. Considerable apparatus and equipment have been added during 1950 and most of what is now in use has a high *use factor*. Some of the more expensive pieces of equipment, such as electronic recorders and indicators, are moved as needed from project to project. It will soon be necessary, however, to allocate some of these permanently to the calorimeter room as soon as instrumentation of this is complete, the most important single physical asset at Cleveland.

No major improvements were made to the property in 1950 but it is being maintained in good condition. It is now necessary to think well ahead about space requirements and essential services, as the number and variety of projects has grown in 1950. These are outlined in the following paragraphs:

Studies at Cleveland Laboratory and Cooperating Institutions

As in previous annual reports, there follow brief reviews of the projects under way at the Cleveland Laboratory and at the nine institutions cooperating in the 1950 program. These are arranged under a number of general headings. Fuller details are given in minutes of the Technical Advisory Committees and in the progress reports made to these Committees from time to time. Visits of Society members to the Laboratory and visits of staff members to organizations within the industry, to our technical meetings, and to meetings of other Societies and associations help to maintain that close liaison between the research staff and industry that is so important. *Selling* the value of this work to management in some sections of this industry is still the big problem. Nothing takes the place of personal contacts, especially if they are accompanied by a desire to *learn* what industry needs from us as well as to *tell* what we are trying to do for industry. It has been the writer's privilege to be able to make more personal contacts in 1950 than in previous years and to gain thereby a better appreciation of the part that the Society's research work can play in the future of this growing industry.

Air Flow and Distribution

Studies coming under the general direction of the TAC on Air Distribution continued to occupy an important place in the program.

Air Flow

At the Laboratory, D. W. Locklin completed an extensive survey and analysis of information available in the American and foreign technical press on energy losses in 90-deg duct elbows. The results were presented at the Muskoka meeting in June. This method of approach, originally intended as the preliminary to an experimental investigation, yielded valuable empirical correlations and data which are quite satisfactory for most engineering uses. The chapter on Air Duct Design for THE GUIDE 1951 has been revised to include these data. The survey should be extended, when conditions permit, to cover losses in vaned elbows, compound elbows and elbows involving change of area.

At Michigan State College, under Lorin G. Miller, studies on the resistance to the flow of air offered by various types of take-off fittings from a rectangular main have continued. These studies present a number of difficult experimental problems, as well as the problem of presenting the results in a simple usable form.

Room Air Distribution

Studies have continued at the laboratory, at Case Institute of Technology, and at Kansas State College. The work at the Laboratory, under H. B. Nottage, has for its objective the establishment of reliable data, both fundamental and practical, on the movement of air arising from the introduction of ventilating jets into confining spaces under non-isothermal conditions. Variables include the size and arrangement of the confining space, the volume of air handled, the initial jet velocity, the turbulence intensity and the temperature difference relative to the surrounding air. Special equipment has been provided in the large laboratory and it is thought that a more fundamental attack is being made on these problems than has generally been the case as judged by available literature. A comprehensive literature survey on the fundamentals of ventilation jet behavior is being prepared for release in 1951.

As part of the instrumentation for these studies, a new type of heated-thermocouple anemometer was developed and the methods of construction and use reported in a paper[1] at the June meeting. The staff working on this project have recently developed a probe for remotely establishing the direction of air velocity; a report on this is now being prepared for publication. A device to measure turbulence intensity was also developed and is in regular use; details will be published later. Smoke trail techniques for determining velocity directions at extremely low velocities have also been perfected and used in this work.

Case Institute of Technology—At the June meeting, G. L. Tuve and his colleagues presented the results[2] of a comparative study of ventilating jets from various types of outlets and showed that a single simple method could be used in most cases. Later in the year, A. Koestel and Chia-Yung Young, both of Case Institute of Technology, submitted for publication a paper on *The Control of Air Streams from a Long Slot.* It presented a method of obtaining uniform air discharge along the entire length of a long slot in the side of a supply duct. Theoretical flow equations were developed and verified by experiment and a practical means of application suggested.

It is expected that this will be published early in 1951. The current studies

[1] A Simple Heated-Thermocouple Anemometer, by H. B. Nottage (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, September 1950).

[2] Comparative Study of Ventilating Jets from Various Types of Outlets, by Alfred Koestel, Philip Hermann and G. L. Tuve (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1950).

are concerned with the investigation of annular slots, ceiling plaques and circular diffusers. The first tests were made with ideal approach conditions and outlet velocities up to 3000 fpm. It has been found that a stream discharging perpendicular to the ceiling from an annular slot ⅛ in. wide and 14 in. in diameter will coalesce into a normal circular stream within 1 ft of the outlet.

Kansas State College—Studies on the downward projection of heated air are being carried on under Linn Helander with the cooperation of the *Industrial Unit Heater Association*. During the year tests have been made of the maximum blow from standard *ASME* nozzles, 8 in., 10 in., 12 in., 14 in., and 17 in. in diameter with initial velocities ranging from 13 to 53 fps and initial temperatures ranging from 156 F to 264 F. The measured maximum blows ranged from 6 orifice diameters to 37 orifice diameters. The temperature and velocity of the stream along its axis were also measured. From the data secured, a formula for maximum blow has been developed which it is expected will provide data of practical value for design purposes over a fairly wide range. Extensive additions were made to the equipment for these studies during the year and much of it has been made automatic. The studies are continuing.

Physiological Research

Human Calorimetry (O.N.R. Contract)

The 1949 report gave details of the design of the calorimeter and other component parts. The calorimeter shell was delivered in February but was found on test to be defective. Following consultations, a new design was immediately prepared and submitted to the fabricators who completed the new shell and delivered it late in September; the plate meters were delivered in November. At the year end the calorimeter shell had been assembled, door frames and doors fitted and some of the piping completed. All equipment for the flow circuits for the calorimeter and the ventilatory air had been placed on order; much of it had been delivered. A great deal of work had been completed on the heat metering layers but the staff were not yet completely satisfied with the methods which were developed to insure the permanent bonding of the layers to the interior surfaces of the calorimeter and the plate meters. Work is proceeding on this phase.

The special advisory committee, together with representatives of the Office of Naval Research, met at the Laboratory late in December and authorized the next steps in the program. The original contract with the O.N.R. expired on June 19, 1950 and was replaced with a new two-year contract.

Environmental Effects.

Studies at the College of Medicine, University of Illinois, were continued during 1950. The research grant-in-aid of the *National Institutes of Health, U. S. Public Health Service*, was renewed for the period July 1950 to June 1951. Society funds were added to this grant.

These studies were planned to determine the existence or absence of physiologic strain in normal and abnormal subjects as shown by an alteration in energy requirement or initiation of a pathophysiologic process. The subjects were moved from a comfortable room to a hot room and back. Additional tests were made with healthy subjects to evaluate recently established ideas of strain.

The study of effects of summer weight clothing on the physiologic adjustments to movement from comfortable to hot environment and back has been completed on 8 normal young women subjects. No gross evidence of strain was obtained.

Work is in progress on cases with abnormal heat production. Five obese cases have been more or less fully observed. Certain cardiac patients have been studied when moved from comfortable to hot environment and back again, the subject being at rest. Some of these patients responded alarmingly to the heat and so the experiment was stopped more or less quickly for these individuals.

Fifteen patients with cardiac disease were studied in winter clothing in comfortable and cool environments (30 F). In no case did subjective sensations become more severe in the cool room than in the comfortable one.

The results would seem to indicate that by studying additional subjects with various types of impaired circulatory mechanisms an analysis can be gradually made of the points of vulnerability when stress is applied.

The effects of humidity have been studied on 10 healthy men who were dressed in union suits. The results indicated that the higher relative humidities were associated with higher skin temperatures in each of the three temperature zones studied (72, 76, and 80 F dry bulb temperature for air and walls) and that these responses depended upon the duration of exposure. The effects appeared earlier in environments of higher dry bulb temperature. The thermal sensations were but slightly affected at the lower temperature by relative humidity. The sensations were not affected by the duration of the exposure (three hours). The results of this study are now being prepared for publication.

Heat Flow and Heat Transfer

Heat Transmission Through Glass

The planned experimental work on measurements of heat flow through unshaded sunlit glass of various types was virtually complete early this year. The paper[3] on solar energy transmittance of figured rolled glass, which was presented at the 57th Annual Meeting, completes the reporting of the main details of these studies, which have been under way for several years. Several supplementary investigations of limited scope, however, were undertaken during the year. For example, a study was made of convection conductances for a flat surface exposed to the natural wind. The heat transfer surface was a single sheet of glass of known solar absorption characteristics. This was installed in the calorimeter, which supplied the heat, and was exposed to winds of various velocities. Measurements were made with the surface parallel to, perpendicular to, and sheltered from the wind flow. These data were necessary in determinations of solar absorptances from previously obtained test data on glass block and configurated glass.

In order to facilitate the development of design heat flow data for sunlit glass, a considerable number of observations were made of the variations of diffuse solar radiation incident upon variously oriented vertical surfaces. A graphical relationship was developed between these values, similar data for a horizontal plane, and the altitude of the sun. Analysis of solar data obtained during the past few years developed other useful relationships between direct and diffuse irradiation of horizontal surfaces and solar altitude. It is planned to incorporate these and related data in a research paper.

The results of another investigation, made to determine the possible relationship between diffuse transmittance by a sheet of glass and its orientation with respect to the sun, seemed to indicate a systematic variation with incident angle of the order of 10 percent between zero and 90 deg incidence.

A paper which summarized the Society's work in fields related to solar heating, particularly the glass heat-flow research, was presented by G. V. Parmelee to the M.I.T. Symposium on Space Heating by Solar Heating held in Boston in August 1950.

Design Data on Heat Flow Through Glass

Considerable progress was made in 1950 in the development of usable design data. At the Semi-Annual Meeting a paper[4] on

[3]Solar Energy Transmittance of Figured Rolled Glass, by G. V. Parmelee and W. W. Aubele (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, February 1951).

[4]Heat Flow Through Unshaded Glass—Design Data for Use in Load Calculations, by G. V. Parmelee and W. W. Aubele (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1950).

COOPERATING INSTITUTIONS

Case Institute of Technology, Cleveland, Ohio: Air Distribution from Jets, Slots, Perforated Panels, and other Forms of Outlets.

Columbia University, New York, New York: Radioactive Study of Moisture Migration in Granular Media.

University of Florida, Gainesville, Florida: Air Entrainment in Hot Water Heating Systems.

University of Illinois, College of Medicine, Chicago, Illinois: Studies of the Physiological Adjustments made by Healthy and Physically Impaired Persons to Sudden Changes in Atmospheric Environment.

University of Minnesota, Minneapolis, Minnesota: (*a*)Solar Energy as a Potential Heat Source for Heat Pump Installations, (*b*) Research Fellowship — Panel Heating Controls.

Kansas State College, Manhattan, Kansas: Projection of Heated and Cooled Air Streams.

The Pennsylvania State College, State College, Pennsylvania: Research Fellowship — Studies on Moisture Permeance.

Cornell University, Ithaca, N.Y.: Continuing Studies on the Effect of Size on Readings of the Sol-Air Thermometer.

Michigan State College, East Lansing, Mich.: Studies of Friction in Rectangular Branch Take-Off Fittings.

the heat flow through unshaded glass—design data for use in load calculations, gave design values of overall coefficients and considerable data on solar heat gain. The latter were greatly extended and prepared by the Laboratory staff for the chapter on Cooling Load in THE GUIDE 1951.

Steps are now being taken to summarize in a research bulletin all of the research on heat flow through glass. This bulletin will contain additional design data as well as experimental data and other information heretofore unpublished.

Convection-Compensated Radiometer

Previous annual reports have mentioned the development of an instrument to measure incoming radiation from all sources. This equipment has been in use for the greater part of 1950; many observations have been made, and a paper describing the instrument and the application of data secured with it is now in preparation.

Shading Studies

An analytical approach to the evaluation of the effects of various types of sunshades was started in 1950 followed by experimental work in the summer and fall. For the present, emphasis has been placed on the slat type of shade. Tests have been conducted on slats of two colors, each at two different slat angles. These results are now being compared with the analytical treatment, which will be extended in the coming year. This comparison requires spectral reflectance data, which are being secured by a commercial laboratory. Tests for absorption of the total solar spectrum are being made at the Laboratory. It is anticipated that this approach to the very complex problem of shading will result in generalized solutions applicable to the large number of glass-shade combinations.

As in previous years, financial and technical support was given to these studies during 1950 by organizations in the glass industry and some segments of the air conditioning industry. This year some of the prominent organizations in the shading industry also supported these studies.

Cooling Loads—Periodic Heat Flow

C. O. Mackey is continuing his studies at Cornell University with the sol-air thermometer; early in the year the Laboratory staff calibrated a new pyrheliometer for use in this work. A careful analysis of the data on sol-air temperatures for New Orleans, which were developed under a cooperative research contract with Tulane University, and the data previously published for New York City and Lincoln, Nebr., showed that it would be advisable to correlate all these data and get them onto a common footing. Pressure of other work made it impossible for us to complete this during 1950; it remains as a project deserving early attention.

At the Semi-Annual Meeting, R. H. Heilman and R. W. Ortmiller of *Mellon Institute of Industrial Research*, Pittsburgh, reported[5] the results of tests, made at the suggestion of the TAC on Cooling Load (W. E. Zieber, *chairman*), on the effective solar absorption of various colored paints. Laboratory staff cooperated with the authors in these studies.

[5]Effective Solar Absorption of Various Colored Paints, by R. H. Heilman and R. W. Ortmiller (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, June 1950).

Table 1—Details of Panels Tested

Panel No.	Size and Type of Tubing	Location of Tubes	Type of Lath
1	⅜ in. non-ferrous	Above lath	Expanded metal
2	⅜ in. non-ferrous	Below lath	Expanded metal
3	½ in. ferrous pipe	Above lath	Expanded metal
4	⅜ in. non-ferrous	Below lath	Gypsum lath

Instantaneous Heat Gains

H. B. Nottage of the Laboratory staff has recently prepared, in preliminary form, a thermal-circuit diagram to attempt to portray and interrelate the major factors which influence the instantaneous thermal load imposed upon air conditioning equipment. This is being submitted for committee discussion and may serve as an outline for a possible analogue approach toward a solution of the time-variable nature of load constituents, a subject which has been given increasing attention in the air conditioning industry in recent years.

Heat Pump

During the year the TAC on the Heat Pump (R. C. Jordan, *chairman*) completed a thorough review of various heat sources and sinks for heat pump applications and made a comprehensive outline of needed information and research that should be carried on to provide required data. A description of this program appears on page 87 of the November 1950 issue of *Heating, Piping & Air Conditioning*.

At the University of Minnesota under a cooperative contract, R. C. Jordan has continued the study of the availability of solar energy as a potential heat source. Phases under study at the present time include investigation of the theoretical availability of solar radiation, evaluation of recorded data, study of horizontal versus vertical radiation and an attempt to provide a rational procedure by which the availability of solar radiation in various geographical areas may be determined.

At Columbia University, under a cooperative research contract, W. A. Hadley and C. F. Kayan have been making an investigation of thermally actuated moisture migration in granular media. This problem was initiated when it was discovered that more heat was arriving at the ground coil of a heat pump than heat transfer theory would predict. Later work showed that there was a significant flow of moisture actuated by the thermal gradient and that its mode of transfer was apparently incompletely understood. Radioactive cobalt is being used as a moisture tracer and its passage is being followed by a Geiger counter. By the year end most of the groundwork had been completed and exploratory runs made. Results from this study will be watched with interest.

Panel Heating and Cooling

Studies under the general direction of the TAC on Panel Heating (P. B. Gordon, *chairman*) and under three of the four groups that comprise this committee have been one of the major activities of the Laboratory during 1950. Work has also been carried on at one cooperating institution.

Two papers[6,7] were published during 1950 which covered the laboratory work on panel heating described in the 1949 Annual Report. The paper, Electric Analogger Studies on Panels with Imbedded Tubes, published in the May JOURNAL SECTION, reported the results of the studies made at Columbia University by Carl F. Kayan under a cooperative research contract.

Plaster Panels

An investigation into the thermal characteristics of plaster panels commenced late in 1949, was completed during the year and a report prepared for committee study. The details of the panels tested are given in Table 1.

Tests were made with the back of the panels uninsulated and with 1½ in. and 3⅝ in. bat type insulation laid in the back of the plaster. Other tests were made with a double yellow pine floor laid on top of the joists, approximately 6 in. above the back of the plaster. After initial tests were completed on panel No. 1, back plastering was applied over the bare tubes to a depth of approximately 3/16 in.

Pending publication of the complete report, it may be said that the tests showed that the difference between the average tube temperature and the average panel surface temperature can be related to the heat output from the lower and upper panel surfaces by an empirical equation. The tests also showed the value of insulation back of a plaster panel and the effect of complete tube imbedment.

From these studies a simple graphical method of designing plaster panels was prepared and submitted for committee study. To answer some of the questions raised by committee members, field tests are being made in Cleveland and in Minneapolis to check laboratory results against actual performance in the field.

Field Tests on Concrete Floor Panels

During the winter 1949-1950, tests were conducted in four homes in Parma Heights, Ohio, a suburb of Cleveland, to obtain data on the heat losses to the earth from floor panels and to determine the effectiveness of insulation in reducing these losses.

[6]Laboratory Studies on Heat Flow Within a Concrete Panel, by C. M. Humphreys, H. B. Nottage, C. V. Franks, R. G. Huebscher, L. F. Schutrum and D. W. Locklin (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, April 1950).

[7]Heat Flow Analysis in Panel Heating or Cooling Sections, by L. E. Hulbert, H. B. Nottage and C. V. Franks (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, April 1950).

A paper[5] reporting the results of the first season's tests was presented at the Philadelphia Annual Meeting. Additional tests are being made during the winter of 1950-1951.

Analogue Tests on Concrete Panels

To extend the range of the experimental thermal tests on concrete panels, it was decided early in the year to modify the electrolytic analogue used in earlier work to permit the investigation of the slab resistance for the case of a concrete panel laid on earth with the tubes tangent to the earth-concrete interface. At the year end the work had been completed for practical cases within the following ranges:

Ratio—Tube spacing to slab thickness: 0.8 to 5.0.
Ratio—Tube diameter to slab thickness: 0.63 to 0.31.
Ratio—Thermal conductivity slab to thermal conductivity earth: 0.50 to 5.00.

A complete report on this work is being prepared for committee study and later publication.

Calorimeter Room

As indicated in the 1949 Annual Report of the Committee on Research, the primary objective in building the calorimeter room was to provide facilities for studies of heat flow from heated or cooled panels to the space. However, the views of several other technical advisory committees were carefully considered in developing the final designs for this room. Construction commenced late in 1949 and by mid-February the TAC on Panel Heating, in consultation with the Laboratory staff, had decided on the main details of the construction; *e.g.*, the type of vapor barrier to be used; the type, size and arrangement of the aluminum panels which form all six surfaces of the room; the use of heat metering layers and other methods of instrumentation. At the end of the year all major construction had been completed, the panels had been fitted, practically all items of equipment had been delivered and set in position, and piping was in progress. All construction, including the arrangements for adjusting the height of the ceiling, was carried out by members of the Laboratory staff at a cost much lower than the original estimates.

While the construction was under way, other staff members were making analytical studies of possible heat exchange in the room, to determine factors likely to be of significance in the planned programs, and also to aid in solving problems of instrumentation. The studies established the number and location of heat meters and of surface temperature thermocouples, and work began at once on the construction of some 150 low inertia heat flow meters that will meter heat exchanges at all room surfaces. It is planned to make the first tests with a ceiling height of 8 ft, to measure panel outputs under controlled room surface temperatures, and relate them to various practical combinations of weather conditions and wall construction. The analyses have indicated that special attention must be directed to the evaluation of convection conductances at panel surfaces, as affected by position, air change rate and room surface temperature distribution. Preliminary planning of a test program is now under way.

Control of Panel Heating Systems

A research fellowship was set up at the University of Minnesota on July 1, 1950 for the purpose of carrying on field studies on the control of panel heating systems under the direct supervision of A. B. Algren. The program is in accordance with the recommendations of *Group D* (J. S. Locke, *chairman*) of the TAC on Panel Heating and Cooling.

Five buildings have been selected for the first year's tests. Two of them, both offices, have heavy panels, heavy construction, and a large glass area. A manufacturing plant was chosen because it had a heavy panel, light construction, and a large glass area. The other two buildings are residences, one with a heavy panel, light construction, and small glass area, the other with a light panel, light construction, and a large glass area.

Room temperatures are being taken at the 66 in. level, 30 in. level, and at the thermostat. The outside dry bulb temperature is being recorded. Panel surface temperatures are being recorded at the inlet, over the pipes and between the pipes, and at the outlet, over the pipes and between the pipes. Water temperatures are being recorded at the inlet to and the outlet from the panel, and at the reservoir.

Temperatures have also been taken manually of the floor surface, the wall and window surfaces, and the ambient air in different locations around the room. Due to the delays in the delivery of thermocouple wire it has not yet been possible to instrument all these buildings. However, it is anticipated that the instrumentation will be completed in time to obtain data during the 1950-51 heating season.

The tentative plan is to modify the control system in each building so that several of the following general control methods can be used: (*a*) on-off or continuous flow of water, (*b*) on-off or continuous flow of heat, (*c*) inside, outside or inside-outside control, (*d*) constant temperature or night setback.

Guide Chapter

Under a subcommittee of the TAC on Panel Heating and Cooling, the chapter on panel heating was completely rewritten for THE GUIDE 1951. The new chapter contains an interim design procedure for concrete panels which is recommended for use until further data become available as a result of the research program.

Industry Support

Industry support of the panel heating research program during 1950 was very encouraging. A substantial part of the funds contributed by industry in 1949 was carried over to 1950 and added to the funds received during the year and to general funds available to the Committee on Research. Of the total expenditures on this program during 1950, including those incurred for the calorimeter room, about 55 percent came from general funds and 45 percent from funds specifically earmarked by contributors. Some of the funds contributed in 1950 were carried over for the 1951 program.

Air Cleaning

It is now almost four years since active work began at the Laboratory on a program formulated by the TAC on Air Cleaning (R. S. Farr, *chairman*) and designed to meet an apparently urgent need for sound and acceptable codes for the testing and rating of air cleaning devices. From the first it was recognized that the problem was complex, and that, in spite of a great deal of work on the subject by competent investigators here and abroad, no standards had been established that were accepted equally by the filter industry and by large users. In the 1948 Annual Report of the Committee on Research, it was suggested that if the principal filter users could say what they wanted a filter to do, it might be of considerable help in defining both the methods and the degree of accuracy to be sought in filter testing. A review of the discussions at the U. S. Conference on Atmospheric Pollution in May 1950 would lead one to believe that the question has been answered only imperfectly, if at all.

The program so far has been designed to answer specific questions relating to the significance of certain factors in the development of standard methods of test. Among these are the velocity and dust distribution in the test duct; the importance of isokinetic sampling, *i.e.*, the removal of the sample at a rate that corresponds to the duct velocity; the location of the samplers; the number and type of samples to be taken; and the relationship between the size of the sampler intake and conditions within the duct, both before and after the filter. Of major importance is the question of the type or types of test dust to be used, and the range of particle sizes that it may be necessary to use in testing different types of air cleaning devices for different applications. The question that has always raised the most controversy is whether efficiencies shall be determined on a weight basis, a discoloration basis, or on both.

A number of reports have been made to the members of the Technical Advisory Committee over the past three years, and the program has followed the lines laid out by them. The time has now come when we must carefully review what has been done to date, and see what remains to be done and whether the present program can hope to lead to the development of standard test methods that will be accepted by manufacturers and users because they are based on scientifically sound data.

Psychrometry

The steps leading to the presentation of a new psychrometric chart were outlined in the Annual Report for 1949. At a special meeting held in Cleveland late in February the form of the chart and other

[5]Field Studies of Heat Losses from Concrete Floor Panels, by C. M. Humphreys, C. V. Franks and L. F. Schutrum (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1951).

technical details were discussed and arrangements made for the presentation of the chart as a research paper.[9] H. B. Nottage presented this paper at the Semi-Annual Meeting. The new chart was accepted and it will appear, reproduced in two colors, in THE GUIDE 1951. A revision has also been made of the chapter on thermodynamics to bring it into line with the new chart. Under the general direction of the Publication Committee pad-size charts are being prepared to supplement the large chart which is suitable for precise calculations and which will be included with each copy of THE GUIDE. It has been decided to await the general reaction of Guide users to the new chart before proceeding with the preparation of additional charts for pressures other than standard barometric and for higher and lower temperature ranges.

The work has been carried on in cooperation with the Guide Committee, which requested the Committee on Research to undertake this important project.

Oil-Heat Institute

Following a meeting in February with the Engineering Committee of the *Oil-Heat Institute of America*, the results of the three investigations carried on in cooperation with the Institute were summarized in two papers,[10,11] one on the rating of fuel oils by a test unit, and the other on the smoke measurement in a fuel oil test unit, which were presented at the 57th Annual Meeting in Philadelphia.

The TAC on Combustion (T. H. Smoot, *chairman*) has suggested that the results obtained to date justify further investigation of the possibilities of the Combustion Reference Test Unit as a means for comparing fuel oils on the basis of their observed burning performance.

Odors

Following a series of discussions by the members of the TAC on Odors (T. H. Urdahl, *chairman*) and a review of possible methods of attack on the problem of odor perception and treatment in occupied spaces, the Committee on Research approved their recommendation that a preliminary survey of the odor problem be undertaken jointly by Arthur D. Little, Inc., Cambridge, Mass., and the Research Laboratory. The survey commenced on June 1 and was completed by mid-August. W. P. Gojsza, of the Laboratory staff, worked with three members of the survey section of Arthur D. Little in interviewing representatives of the heating, ventilating, and air conditioning industry regarded as well-informed on its odor problems. The report of the survey, submitted late in August, stated that the results indicated (1) that an odor problem of serious significance exists for the industry, and that substantial effort is warranted to solve it; (2) that tobacco, bodies, food and air conditioning equipment were considered to be the most troublesome and common odor sources; (3) that odor control was considered largely an economic problem; (4) that the establishment of an objective means of determining amounts of odors present is highly desirable, but there was considerable doubt that this could be attained by the Society within a reasonable period.

The TAC on Odors recommended to the Committee on Research that the Society undertake a research program on odors aimed initially at applied research, and that studies be commenced as rapidly as possible to investigate (*a*) the relationship of the principal physical characteristics of air, particularly temperature and humidity, to the development and perception of odors of varying types and levels; (*b*) the role of conventional air conditioning in odor reduction; and (*c*) the cause of air conditioning odors under various operating conditions with respect to the system components.

These recommendations were approved by the Committee on Research. Odor studies were included in the 1951 research program and initial steps taken to design and construct two relatively odor-free test rooms at the Cleveland Laboratory.

The report also proposed the development of a long-range program of fundamental research in odors, in cooperation with other interested groups. It was suggested that one of the first steps might be the holding of a National Symposium on Odors. At the year end preliminary negotiations towards this end were under way, in cooperation with certain divisions of the Office of Naval Research.

Hot Water and Steam Heating

A new Technical Advisory Committee (John James, *chairman*) was set up in mid-year to advise the Committee on Research regarding studies on problems in hot water and steam heating. One of the projects assigned to this Committee for advisory guidance was a cooperative research study on air entrainment in hot water heating systems, which had been set up earlier in the year by the Committee on Research at the University of Florida.

Under this contract, earlier studies of air removal from a forced circulation hot water heating system which had been under way at the University, were broadened to include ways and means of preventing or clearing water separation caused by restrictions in the piping system. An experimental system was made up mainly of one-inch glass pipe and fittings, and some preliminary tests made with an open expansion tank. It is too early to expect any conclusive results, but the studies are being followed with interest.

At the organization meeting, the Committee recommended that a fundamental study be undertaken to determine the relationship between noise and pipe size, piping arrangement and fluid velocity in hot water and steam heating systems. Steps are being taken to set this up as a cooperative research project.

Sorbents

The TAC on Sorbents (John Everetts, Jr., *chairman*) developed, early in the year, a recommended method for testing and rating sorption type dehumidifiers and requested the Committee on Research to allocate funds for carrying out field tests of a solid and a liquid sorbent dehumidifier to determine if the proposed method was practicable and workable. Unfortunately, it was not possible to find any field installations in or near Cleveland that would lend themselves to the test procedures as outlined. Plans to carry out tests in a manufacturer's plant had to be postponed; the Committee are reviewing the proposed methods to see if they can be made adaptable to systems as they are commonly installed in the field.

The Guide

The TAC on Combustion has undertaken to suggest revisions for THE GUIDE 1952, Chapters 13, 14 and 17, on Fuels and Combustion, Automatic Fuel Burning Equipment, Estimating Fuel Consumption for Space Heating.

The TAC on Insulation (M. W. Keyes, *chairman*) will propose some revision of Guide material bearing on insulation and insulating materials.

Meetings

The Director of Research, together with C. M. Humphreys and G. V. Parmelee, presented a paper entitled *The Role of Weather Data in Heating and Air Conditioning*, at the Conference on Weather and the Building Industry, arranged by the Building Research Advisory Board (BRAB) and held in Washington, D. C., January 12, 1950.

During the year the Director of Research spoke before the Statistical Exchange of Southern Florida at Miami; the Air Conditioning Conference at the University of Florida, Gainesville; the Warm Air Conference at Iowa State College; and the *Institute of Boiler and Radiator Manufacturers* at Absecon, N. J. He also represented the Society at the U. S. Technical Conference on Air Pollution in Washington in May; at a conference at the Library of Congress in November; and at the *ASRE* annual meeting in December. Staff members addressed Society chapters at Philadelphia, Dayton, North Carolina, and Indianapolis.

Acknowledgments

We have been able to make substantial progress in 1950 in a number of important projects. Some projects have been brought to a successful conclusion. This has been due in no small measure to the encouragement and support given to the staff by the President and the members of the Council, and especially by the chairman and members of the Committee on Research and the members of the various Technical Advisory Committees. The writer wishes to express the sincere appreciation of the 25 members of the research staff for this support and to express his thanks to all staff members for their loyal service and cooperation.

[9] A Proposed Psychrometric Chart, by H. B. Nottage (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, July 1950).

[10] Rating of Fuel Oils by a Test Unit, by D. W. Locklin and G. V. Parmelee (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1950).

[11] Smoke Measurement in a Fuel Oil Test Unit, by D. W. Locklin and G. V. Parmelee (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, November 1950).

Westward Ho!

Semi-Annual Meeting 1951 Portland

Committee on Arrangements

B. W. Farnes, *General Chairman*
E. O. Eastwood, *Honorary Chairman*
F. F. Urban, *Vice Chairman*

Attendance Promotion—C. W. Brissenden
Banquet—T. E. Taylor
Entertainment—E. R. Lokey
Finance—J. D. Kroeker
Ladies—J. P. McDermott
Publicity—A. N. Hoss
Reception—W. B. Morrison
Sessions—F. W. McCarthy
Sports—R. P. Lankow
Transportation—J. A. Freeman

THE Oregon Chapter of Portland, the City of Roses, extends a truly cordial invitation to all ASHVE members and their families to attend the Society's 1951 Semi-Annual Meeting, July 2-4. With headquarters at the Multnomah Hotel, one of the finest centers of western hospitality, this summer meeting promises unlimited opportunities before, during, and after the official calendar of events, to enjoy a memorable vacation stag, or family style, in a wonderland of natural beauty.

Portland — famed for its proud *I own my home and it's my castle* attitude — sets astride the Willamette River and at many points its northern city limit is washed by the mighty Columbia River, which serves as a boundary line for Oregon and Washington. Portland, as a hub, is girdled tightly by wondrous scenic areas; world famed monuments of nature such as, the never barren of snow Mount Hood, the never dry Multnomah Falls, the never drab Columbia River Gorge and the never still Pacific Ocean. Man, too, has added monuments — skillfully engineered to provide functional value with breath-taking beauty as a companion attribute. In the latter domain are Timberline Lodge, fashioned almost entirely of hand-hewn native woods; Bonneville Dam, a powerful and concrete example of mind mastering matter; and of unique interest to ASHVE members, Portland's two most modern buildings, the Equitable and the Oregonian, wherein may be seen the nation's two largest heat pumps.

Multnomah Hotel in Portland, Ore.

The Committee on Arrangements of the Oregon Chapter has planned carefully the events which are to augment presentation of technical subjects as scheduled by the Program and Papers Committee. Four technical sessions are planned and the subjects of discussion cover a wide variety.

Main social events of *Monday, July 2* are: (1) ASHVE Golf Tournament; (2) Bus tour to Multnomah Falls via Columbia River Highway: (3) Buffet Dinner Party with entertainment and dancing in a Hawaiian atmosphere. *Tuesday, July 3:* (1) For the ladies, a tour through the park and residential sections encircling the city's business center with a long stop at Portland's renowned International Rose Test Gardens; (2) For the ladies (enroute to a later dinner rendezvous with the gentlemen) an opportunity to visit a grotto unsurpassed — The Sanctuary of Our Sorrowful Mother; (3) At Timberline Lodge (6000 ft elevation) on the south slope of Mount Hood, a Salmon bake dinner, this truly western feast in a naturally air conditioned mountain retreat will live in the history of Society meetings. *Wednesday, July 4:* (1) "Mollala Buckaroo" a wild west rodeo — cowboys, cowgirls and

Indians provide a thrill-packed spectacle of daring horsemanship — bronco busting, calf and steer roping; (2) Inspection tours of the Equitable and Oregonian Buildings; (3) Semi-Annual Banquet.

Again let us urge you to plan a family vacation to include of course the date of the Semi-Annual Meeting, July 2-4, 1951. Upon leaving Portland head west. In two short hours, the Pacific Ocean may be viewed from the western terminus of the Old Oregon Trail at Seaside, Ore. From there southward via highway 101 one may in leisurely fashion follow for 300 miles the unsurpassed scenic panoramas of Oregon's coastline. Travelling 70 miles inland from the southern Oregon coast, a rare natural phenomena may be observed at Oregon Caves known to many as the Marble Halls of Oregon, where under great canopies of stone, stalagmites and massive pillars stand as guardians of this unique gallery. In perfect travel continuity and only 150 miles north and eastward from the Caves is Crater Lake National Park. Where once a fiery volcano roared to self-destruction, a seemingly bottomless lake now reposes in the crater.

Countless other equal attractions dot the length and breadth of Oregon. All are easily accessible for July visitors. If you are a photographic hobbiest or a professional, Oregon is *your* paradise. Bring those cameras. Remember too, Hawaii and Alaska are our next door neighbors (by air). More details on air, rail and water travel routes will follow in a later issue.

Oregon Chapter is anxiously awaiting your arrival.

*Summary of Chapter Meetings**

• *BALTIMORE*—January 17, 1951. The meeting was a joint one with the Washington, D. C. Chapter of ASHVE and the Baltimore-Washington, D. C., Section of *ASRE*. The program consisted of an inspection tour of the Friendship International Airport which was followed by a dinner and business meeting. Mr. Beavin was the speaker of the evening, and in his talk he included a description of the design, construction and operation of the mechanical features of the airport. He used slides to illustrate the talk.

• *BALTIMORE*—December 20, 1950. Following dinner in the Engineers Club, the business meeting was called to order by Pres. G. B. Priester. A notice was then read to the members from Legal Counsel for the Society reviewing the statutes, documents, and rulings pertaining to the limitations on the power of the Society and its agencies to engage in legislative activities. It was announced that the January meeting would be a joint one with the Baltimore-Washington Section of *ASRE* and that members of the ASHVE Washington, D. C., Chapter are invited to attend. The program will include an afternoon trip to Friendship Airport and dinner and a business meeting at the Engineers Club. Further announcements included the meeting of the Engineers Club and affiliate societies at the Maryland Casualty Auditorium on January 18, 1951, at which time Dr. Perine of the American Telephone and Telegraph Co. will speak on Communications and Electronics.

J. F. Malone introduced the speaker of the evening, Dr. N. E. Berry, director of research, Servel, Inc., Evansville, Ind., who spoke on *Absorption Refrigeration and Air Conditioning*. Dr. Berry used slides to illustrate his talk, which was followed by a lively discussion period. Attendance 39. Attendance ratio 0.39.

• *CENTRAL OHIO*—January 15, 1951. Pres. H. G. Hays called the meeting to order at 8:00 p.m. in the Southern Hotel and the minutes of the December meeting were read and approved. The treasurer's report was given, which was followed by the reading of a letter from Ohio State University requesting that two ASHVE members be appointed to serve on the Advisory Board for the State Code. President Hays appointed R. S. Curl and N. T. Hess. R. J. Schmitz, Jr., introduced the speaker of the evening, Harry C. Ballman, who gave an interesting talk on *Air Pollution*, using slides which compared Columbus in 1948 and 1950. Mr. Ballman's talk was followed by a question and answer period. Attendance 32. Attendance ratio 0.24.

• *CONNECTICUT*—January 18, 1951. Members and guests met at the Three Cups Inn, Meriden, and Pres. D. M. Hummel called the meeting to order at 8:15 p.m. The minutes of the previous meeting and the treasurer's report were read and approved. A recommendation was made by the board of governors that the chapter donate $100.00 from the treasury to the Society's Research Fund, and the members unanimously approved. A nominating committee was appointed to elect officers for the year 1951 as follows: S. R. Osborne, *chairman*, Peter Fleury, C. F. Ganter, C. E. Weisner, and C. J. Wahnquist, Jr.

The speaker of the evening was L. P. Herrington, director of research, John B. Pierce Foundation, Laboratory of Hygiene, New Haven, Conn., who spoke on *The Human Factors in Convective and Radiant Heating Systems*. Dr. Herrington used slides of various charts to illustrate his talk, which was well

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

received. The meeting adjourned at 10:15 p.m. Attendance 74. Attendance ratio 0.31.

• *GOLDEN GATE*—January 4, 1951. The meeting was called to order at 7:25 p.m. in the Engineers Club, San Francisco, and following the reading and approval of the minutes of the December 14 meeting, the guests were introduced. It was announced that the chapter would grant leave without dues to members who are in the military services and that the May monthly meeting would be changed back to be the annual meeting.

John E. Haines, vice president, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., and member of the Society's Council was the speaker of the evening. Mr. Haines gave an illustrated talk on *Solar Heating and Its Control*, which was followed by an interesting and informative question and answer period.

The tellers of election announced that the following were elected as the officers for the year 1951: *president*—R. C. Cushing; *vice president*—T. J. Janes; *secretary*—T. J. White; *treasurer*—J. E. Murray; and *board of governors*—F. K. Crouch, D. E. McLeod and Eric Roberts. C. E. Bentley presented the past president's pin to K. F. Baldwin, the retiring president. Attendance 43.

• *ILLINOIS*—January 8, 1951. The meeting was called to order at 8:00 p.m. by Pres. P. J. Marschall in the Merchants & Manufacturers Club and was followed by the introduction of new members of the Illinois Chapter and the introduction of out-of-town guests. H. C. Stevens introduced the first speaker of the evening, Roland R. Reiche, of Economy Gas Furnace Co., who discussed latest designs in gas burners and combustion chambers used in home heating units.

N. A. Gregornik introduced R. W. Roose, Research Assistant Professor of Mechanical Engineering, University of Illinois, who spoke on *Research in Warm Air Heating*. Mr. Roose showed slides which illustrated the comparative temperature gradients found in the University of Illinois Research Home using four methods of heating—forced air, high side wall, low side wall, gravity and perimeter warm air heating. He stated that perimeter heating was better for the ranch style home. Variations of all methods of heating were actually tried in the house and the results were explained by Mr. Roose. Mr. Roose's talk was enthusiastically received by the audience and the secretary's report indicated that the talk was one of the most outstanding ever given before the Illinois chapter. Attendance 86.

• *ILLINOIS*—December 11, 1951. Following a social hour and dinner the meeting was called to order by President Marschall. Following the introduction of new members and out-of-town guests, A. L. Walters presented a Life Membership Certificate to B. K. Eaton.

The meeting was then turned over to C. M. Barnes, who introduced the speaker of the evening, P. B. Gordon, vice president of Wolff & Munier, Inc., New York, N. Y. After explaining why and how the ASHVE panel heating research program was set up and how it is functioning, Mr. Gordon described various tests which have been made and others which are still in progress. Mr. Gordon displayed charts which provided design data on radiant heat exchange in buildings. The data relate the panel heat output to panel temperature for radiant heat only, for convected heat only, and for combined heat transfer. Another chart displayed related total panel heat output, for both ceiling and floor panels, to panel surface temperature and the unheated mean radiant temperature.

In speaking of cooling panels, Mr. Gordon expressed the opinion that they can be used even at temperatures of 70 and 80 F to enhance the thermal storage of buildings, to directly intercept radiant energy (as from lights), as a means of cooling a room (the reverse of radiant heating) and to affect the comfort relationship by lowering the mean radiant temperature. Mr. Gordon expressed the opinion that panel cooling, by itself, will never take over the entire job of cooling a building. Its greatest advantage, he stated, would be to reduce cooling loads on air conditioning systems, thus reducing equipment and duct sizes. The savings, he stated, probably would not justify the costs of cooling panels; however, where heating panels are specified, the use of the same panels for cooling would seem justified. After an informative question and answer period, the meeting adjourned. Attendance 148.

• *INLAND EMPIRE*—December 8, 1950. Pres. W. C. Vradenburg called the meeting to order at 8:30 p.m. in the Spokane Hotel and the minutes of the previous meeting were read and accepted. T. P. Nau gave the financial report and L. E. Marque reported on programs for future meetings, stating that the topic for the January meeting would be *Technical vs. Practical Heating Phases of Business*. Reports were also made by the publicity, attendance, finance and membership committees.

Mr. Marque introduced the speaker of the evening, P. D. Close, who gave a very interesting talk on *Insulation Problems*. The meeting adjourned at 10:40 p.m. Attendance 18.

• *IOWA*—December 12, 1950. D. E. Wells, acting president, called the meeting to order at 8:00 p.m. in the Standard Club, Des Moines, and following the roll call of members and the introduction of guests, the minutes of the November meeting were read and approved. R. S. Stover and C. H. McGuiness were appointed as member and alternate member, respectively, on the Chapters Conference Committee.

P. B. Gordon, vice president of Wolff & Munier, Inc., New York,

N. Y., was introduced and spoke on *Panel Heating Research*. Mr. Gordon opened his talk by giving the history of the development and assembling of panel heating data, stating that his first talk on panel heating was given in 1938. He stated that at this time there was not too much material on this subject available, and that since this time the material for his talks had become much more specific. In 1947 a meeting was held which included representatives of the various groups interested in panel heating, and the following questions were: (1) Was the available information satisfactory? (2) Was added information needed? (3) Should the Society be the one to assemble this information? As a result of the meeting, it was evident there was a definite demand for additional information and it was decided that the Society should participate. The necessary committees were then organized for assembling and coordinating the data.

Mr. Gordon used slides to illustrate the sequence in which the data were to be assembled, the methods used for deriving the data, and the expanded facilities being provided for additional experimental work. Slides were also shown of the charts developed from the various experimental panels under varying conditions.

Mr. Gordon also touched on the subject of panel cooling and its possible relationship with panel heating and its use to provide supplementary cooling in conjunction with air as a primary cooling medium or the use of the panel as a primary cooling source. Following an interesting question and answer period the meeting adjourned. Attendance 31.

• *KANSAS CITY*—Jaunary 8, 1951. Members and guests met in the Roof Garden of the Aladdin Hotel, Kansas City, Mo., and Pres. W. E. Howarth called the meeting to order. The minutes of the December meeting were read and approved as read. Reports were given by D. M. Allen for the membership committee, T. I. Harriman for the student branch relations committee, F. K. Ladewig for the newsletter committee, and G. H. Stoffer gave the treasurer's report. C. W. Schumacher announced that the speaker at the next meeting would be V. D. Wissmiller, supervisor, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., who would speak on *Electronic Control of Heating, Refrigeration and Air Conditioning*. A film entitled *Make Mine Freedom*, prepared by the Extension Department of Harding College, was shown through arrangements made by E. K. Campbell.

D. H. Painter introduced the guest speaker, Ferdinand Jehle, engineering consultant, Sales Dept., Hoffman Specialties Co., Indianapolis, Ind., who spoke on *Panel Heating and Its Control*. Mr. Jehle covered the various aspects from the fundamental heat calculations, piping layouts, air venting, controls, and the application of valves which provide a simple and positive means for variation of temperatures in separate rooms. The talk was followed by an interesting discussion period which was enjoyed by the audience. Attendance 69. Attendance ratio 0.31.

• *MASSACHUSETTS*—January 16, 1951. Following the social hour and the dinner held in the Campus Room of the M. I. T. Graduate House, Pres. D. W. Blair welcomed the members and guests. It was announced that a decision was made at the board of governors meeting to extend an invitation at the Society's 57th Annual Meeting in Philadelphia to hold the 1954 Annual Meeting in Boston.

John Bonner introduced Lester T. Avery, Cleveland, Ohio, president of the Society, who gave a very interesting talk on *Dynamic Air Conditioning*. In his talk, Mr. Avery emphasized the importance of air purity and quality and the fact that it can be accomplished by the use of the proper filters or treatment. Bacteria and virus require one kind of purification, dust another, and gases and fumes a still different one, he pointed out. The complete purification, he stated, could require a number of different steps using a different technique in each case.

Mr. Avery maintained that by keeping the temperature between 73 and 78 F and the relative humidity between 30 and 50 percent, the majority of people are comfortable and work efficiently. He further stressed that the proper temperature was essential and that too low a temperature could cause just as much inefficiency as too high a temperature. Mr. Avery showed several slides, along with his talk, of actual jobs of air conditioning and air supply systems to provide good working conditions. A discussion period followed the talk. Attendance 45. Attendance ratio 0.28.

• *MEMPHIS*—December 18, 1950. The meeting was called to order in the King Cotton Hotel at 6:30 p.m. with Pres. C. S. Fischer presiding, who introduced and welcomed the guests.

The speaker of the evening, Raymond Mancha, vice president, ventilation equipment, Joy Manufacturing Co., Pittsburgh, Pa., was then introduced. Along with the talk, Mr. Mancha showed a film covering the design, construction, and the manufacturing process required for axial types of fans. President Fischer thanked Mr. Mancha for his interesting presentation on behalf of the Chapter at the conclusion of Mr. Mancha's talk. Attendance 18.

• *MIAMI VALLEY*—December 4, 1950. Following dinner at the Y.M.C.A. at 6:30 p.m., Pres. C. D. Weaver called the meeting to order and the minutes of the two previous meetings were read and approved as read. Nominations for a member from the Miami Valley chapter to serve on the Chapters Conference Committee were called for, and President Weaver was elected to represent the Chapter at the Society's 57th Annual Meeting in Philadelphia.

President Weaver announced that

the meeting date would be changed from the first Monday to the first Wednesday of the month just as soon as the previously scheduled speakers' engagements are fulfilled. It was agreed that the January meeting be held in the Y.M.C.A.

R. C. Allen, program chairman, introduced S. R. Lewis, past president of the Society and consulting engineer of Chicago, Ill.

Mr. Lewis told of his many experiences with forced hot water heating and compared this type of heating with the circulatory system in the human body. Mr. Lewis' talk proved very interesting and according to the secretary's report the question and answer period proved most enlightening to those present. Attendance 35.

• *MICHIGAN*—January 15, 1951. The formal order of business was dispensed with as this was the annual Detroit Edison night at which time the Detroit Edison Co. acts as host to the Michigan Chapter. After dinner, which was served with the compliments of the company, the members adjourned to the auditorium. F. M. Hull and W. D. McCully presented a very interesting talk on *How the Detroit Edison Co. Installs 138,000 Volt Pipe Type Cable Underground*, stating that the company is one of the pioneers in the field of installing high voltage cable underground. The cables are installed in somastic coated steel pipe and the pipe is then filled with nitrogen at 200 psig. Thirty-five miles of this pipe-type cable have been installed and are in service. The talk was illustrated with movies and exhibits.

The Michigan Chapter is indebted to the company for their generous participation in the meeting and extended specific thanks to G. D. Winans and E. E. Dubry and the other members of the Central Heating Department. Attendance 100.

• *MINNESOTA*—January 8, 1951. This was a joint meeting with the Twin Cities Section of the *ASRE*, and was held in the Garden Room of the Dyckman Hotel and was officially opened at 7:50 p.m. by Pres. G. M. Kendrick of ASHVE Chapter. After introducing the guests of the evening, President Kendrick introduced M. H. LaJoy, president of the Twin Cities Section of *ASRE*, who in turn introduced Richard Turpin, national secretary of the *ASRE*.

Prof. A. B. Algren then introduced the speaker of the evening, Dr. Ralph Montona, director of the Engineering Experiment Station at the University of Minnesota. Dr. Montona gave an excellent talk entitled *Research and You*.

The second speaker introduced was Dr. Rolf Von Ziedel, who presented a very humorous dissertation on the lighter side of atomic power. The meeting was adjourned at 8:50 p.m. Attendance 130.

• *MONTREAL*—December 11, 1950. The meeting was called to order in the Berkeley Hotel by Pres. R. R. Noyes and the minutes of the November meeting were read and approved as read. The speaker of the evening, A. C. Wilkinson, of Electrolux, Ltd. (Canada), was introduced and addressed the meeting on *The Fitly Spoken Word*, a humorous talk on saying the right thing on the right occasion.

Following the address, the members enjoyed a social evening together, which included the collection of toys brought by each member to be donated for Christmas to the Children's Memorial Hospital and the Shriners' Hospital. Attendance 49.

• *NEBRASKA*—January 9, 1951. K. E. Martin, vice president of the Chapter, called the meeting to order at 6:45 p.m. in the Hotel Castle, Omaha. There being no chapter business on hand, the speaker of the evening, E. K. Campbell, president of E. K. Campbell Heating, Co., Kansas City, Mo., was introduced. Mr. Campbell spoke on *Most Heating is by Air Movement*. Having very successfully spent most of his career in the field of heating, Mr. Campbell has extensive knowledge on the subject and, according to the secretary's report, presented a very interesting talk on the principles of air distribution and designs of ductless distribution systems for large installations. Mr. Campbell's talk was well received and was followed by an informative question and answer period. Attendance 41.

• *NEBRASKA*—December 12, 1950. Pres. G. W. Colburn called the meeting to order in the Hotel Castle at 6:30 p.m., which was followed by the roll call of members and guests. The speaker of the evening, C. S. Stock, manager, unit ventilator sales division, Herman Nelson Div., American Air Filter Co., Inc., Moline, Ill., spoke on *Fundamentals of Classroom Comfort*. From his years of study and experience, Mr. Stock gave a very comprehensive talk on the problems and their solutions in meeting the thermal requirements for classroom comfort. The talk was enjoyed and well received. Attendance 21.

• *NEW YORK*—January 15, 1951. Members and guests met in the Building Trades Club at 6:00 p.m. for a social hour, followed by dinner at 7:00 p.m. Pres. C. F. Kayan called the business meeting to order at 8:00 p.m. and the minutes of the November 20 meeting were read and approved. President Kayan commented on the very successful Christmas party, which had been enjoyed by the members, under the direction of J. E. Schechter, and his committee who were given a vote of thanks. President Kayan announced that the new Empire State Capital Chapter was being given its Charter this same evening and he stated that the New York Chapter had sent a message of congratulations and best wishes.

J. B. Hewett, program chairman, introduced L. F. Livingston, manager Extension Division, E. I. Du Pont de Nemours & Co., Wilmington, Del., who spoke on *How Modern Industrial Chemistry Creates Products for Better Living*. Mr. Livingston

exhibited products resulting from research by his company, the first material displayed being orlon fiber and cloth made from it. Mr. Livingston wore a suit of orlon cloth and demonstrated its wrinkleproof characteristic. Cellulose sponges, which could be collapsed to one-third the original size and still return to original size when dipped in water, were exhibited. The development of rayon, cellophane, and orifon cloth was outlined and it was interesting to note that the latter product stops the progress of fire which reaches it from other materials. Teflon material, developed for motor insulation, was mentioned as a product which could reduce the weight of motors by 60 percent because it could withstand high temperatures. It also is being made into gaskets for pipelines. Nylon has been applied to baby carriages as bearings and has been found to be squeakless even when operated without oil.

Mr. Livingston continued to show new products and uses for them and also answered questions from the audience until 9:30 p.m. when he was extended a rising vote of thanks. Attendance 60.

• *NORTH TEXAS*—January 15, 1951. Pres. R. G. Lyford called the meeting to order in the Melrose Hotel at 8:00 p.m. and the minutes of the November and December meetings were read and approved. Following the introduction of members and guests, Elliott Hallowell, member of *ASRE*, described an educational conference to be held in Dallas on January 26-28, sponsored by the *Refrigeration Equipment Manufacturers Association*. Its purpose was the discussion by well qualified authorities of the problems encountered in the installation and operation of refrigeration apparatus. The members of the North Texas Chapter were invited.

Following reports by the treasurer, the program chairman and the hospitality chairman, President Lyford announced the appointment of the 1951 committees. L. S. Gilbert and R. C. Knight were called on to give a preview of their plans for the year regarding the programs on membership. Mr. Gilbert asked for the members' opinions regarding programs for 1951. The sentiment seemed to favor, in general, technical programs rather than non-technical and local speakers rather than out-of-town speakers. The meeting adjourned at 9:00 p.m. Attendance 58. Attendance ratio 0.38.

• *NORTH TEXAS*—December 18, 1950. The December meeting was a dinner dance held at the Lakewood Country Club.

During the course of the evening, the election of the following officers for the year 1951 was announced: *president*—R. G. Lyford; *vice president*—R. E. Allison; *secretary*—P. N. Vinther; *treasurer*—M. W. Brown; and *board of governors*—Herman Blum, C. Rollins Gardner, and H. G. Gregerson.

• *NORTHEASTERN OKLAHOMA*—January 9, 1951. Members and guests met at Smith's Restaurant at 6:30 p.m. for dinner, and Pres. A. D. Holmes called the business meeting to order at 8:05 p.m. Following the reading of the minutes of the previous meeting, and the roll call of members, the guests were introduced by their member hosts. The report of the election of officers was made and the following members were installed for the year 1951: *president*—R. F. Shoemaker; *vice president*—J. N. Watt; *secretary*—F. M. Thomas; *treasurer*—C. H. Dollmeyer; and board of governors—A. D. Holmes, E. R. Cooke, and V. W. Miles.

The meeting was then turned over to President Shoemaker. A discussion was held concerning the ASHVE role in the forthcoming National Warm Air Heating & Air Conditioning Conference to be held in Tulsa on March 12 and 13, 1951 at the Mayo Hotel.

Mr. Dollmeyer introduced the speaker of the evening, Ferdinand Jehle, engineering consultant, sales department, Hoffman Specialty Co., Indianapolis, Ind., who gave a very interesting talk on *Panel Heating*, covering panel location, panel size, heat output of panels and control systems, using slides to illustrate his talk. Attendance 18.

• *NORTHERN OHIO*—January 8, 1951. The meeting was called to order by Pres. W. M. Rowe in the Warner Auditorium and the minutes of the December meeting were read and approved. L. C. Burkes, program chairman, announced that L. F. Collins, chemical engineer, The Detroit Edison Co., Detroit, Mich., would be the speaker at the February meeting and his topic would be *Corrosion*. W. F. D. Neiheiser, entertainment chairman, announced that the fifth annual banquet of the *Cleveland Technical Societies Council* would be held on January 29 at the Hotel Carter and asked that the chapter be well represented. President Rowe announced that a letter of congratulations from the Chapter had been sent to the newly formed Empire State Capital Chapter.

President Rowe then turned the meeting over to R. E. Sherman, who introduced the speaker of the evening, A. G. H. Dietz, professor of structural engineering, Massachusetts Institute of Technology. Professor Dietz stated that the energy from the sun falling on one square mile in area in two days equalled the energy contained in one atomic bomb explosion. He illustrated the importance of solar energy by stating that the available atomic energy appears at the present time to be no greater than our coal reserves. He stated that solar energy and atomic power are now on the same economic level and that he looked for a great deal of work on the subject of solar energy in the next 10 years. Professor Dietz then developed the theory of solar heat collectors, described the weather analyses required for solar heating designs, explained the principles of various heat storage methods, and showed pictures of actual solar heating installations. Professor Dietz' talk was very well presented and evoked considerable discussion in the question period which followed. Attendance 50.

• *OKLAHOMA*—January 15, 1951. Pres. R. E. Swan called the meeting to order in Beverly's Drive-In, Oklahoma City, at 8:00 p.m. The speaker of the evening was R. R. Irwin, assistant professor, School of Mechanical Engineering, Oklahoma Institute of Technology, Oklahoma A & M College, Stillwater, who spoke on *Designing Engineers for the Future*. Professor Irwin discussed the facilities and curricula available both at the College and at extension localities throughout the state for the training of engineers for the future. He further discussed the part that these engineers would play in the future industry of the state as well as the part that industry could play in the present training and education of these engineers for future positions. The meeting adjourned at 9:15 p.m. Attendance 44. Attendance ratio 0.36.

• *OKLAHOMA*—December 11, 1950. The meeting was called to order by President Swan in Beverly's Drive-In, Oklahoma City, at 8:00 p.m., F. C. Brandt, sales manager, Minneapolis-Honeywell Regulator Co., Dallas, Tex., was the speaker of the evening. Mr. Brandt spoke on *New Developments in Residential and Commercial Comfort Controls*, discussing the need for controls in recent building developments and the various manners in which these needs can be met. The meeting was adjourned at 9:00 p.m. Attendance 50. Attendance ratio 0.29.

• *ONTARIO*—January 23, 1951. Pres. J. H. Fox called the meeting to order at 7:00 p.m. at the Royal York Hotel, following dinner at 6:00 p.m. President Fox then announced the death of D. R. Steeves, a valued member of the Ontario Chapter. President Fox then called on F. A. Hamlet who welcomed the members of the University of Toronto Student Branch, stating that the University of Toronto Student Branch is the 11th student branch in the Society and the first one in Canada. C. S. Leopold, consulting engineer from Philadelphia, Pa., presented the charter to H. F. Spragg, president of the Student Branch. Professor Allcut, head of the School of Mechanical Engineering, spoke on behalf of the University and the Student Branch.

Mr. Leopold then addressed the chapter on the subject *Indoor Atmospheric and Thermal Environment*, accompanying his talk with slides. A discusson period followed the talk. Attendance 164.

• *ONTARIO*—December 8, 1950. Members and guests met at the Royal York Hotel for dinner at 6:00 p.m., and President Fox called the business meeting to order at 7:00 p.m., announcing that Harry Simpson had passed away after a long illness. President Fox then announced that at the January meeting the Ontario Chapter would act as host to the University of Toronto Student Branch, at which time the student branch would be given its charter; that the February meeting would feature G. Lorne Wiggs, who would speak on the heating, ventilating and air conditioning in the New Manufacturers Life Bldg., Toronto; and that the March meeting would feature a panel discussion on multiple housing.

M. W. Shears was introduced and spoke on the revision and the matter of bringing up to date the Ontario Chapter's Code on Heating of Residences up to 50,000 cu ft content. Mr. Shears pointed out that the revised code would not include panel heating, as there are too many controversial matters to be settled in this type of heating at the present time.

The guest speaker of the evening, John W. James, chief research engineer, McDonnell & Miller, Inc., Chicago, Ill., was introduced and spoke on *Operation of Hot Water Heating Systems* using slides to illustrate. Mr. James' talk was received with a great deal of interest among the members and guests and was followed by a discussion period. Attendance 123. Attendance ratio 0.40.

• *OREGON*—December 21, 1950. The meeting was called to order by Pres. R.C.Chewning and the minutes of the November meeting were read and approved. W. D. Maxwell gave a report on the activities of the Civil Defense Committee stating that the Professional Engineers of Oregon had arranged for this Committee to collaborate with and advise the governor of the State of Oregon, the director of Oregon Civil Defense and the mayors of the principal cities on the engineering activities of civil defense. Mr. Maxwell pointed out that the response of the engineering profession to a call for service on this committee was very gratifying and that 104 buildings had been surveyed by 200 of the volunteers and the city's building inspectors. Mr. Maxwell mentioned that the Bureau of Buildings was preparing an area survey to determine areas without adequate shelters, and that in the near future all schools would be surveyed to determine the best shelter area in the various buildings.

Pietro Belluschi, who was recently appointed Dean of the Architectural Department of M.I.T., was introduced and made several pertinent remarks about architecture and engineering in general, and pointed out that one of the outstanding things to be accomplished in the future by the professions was the overall control of cities and outlying areas for planning utilitarian and aesthetic effects.

W. B. Morrison introduced Elmer Buckhorn, patent attorney and engineer, who gave his impressions of a trip through Western Europe during last summer. Attendance 129.

• *PITTSBURGH*—January 8, 1951. Following dinner, Pres. A. F. Metzger called the meeting to order in the Hunt Room of Webster Hall and the minutes of the December 11 meeting were read and approved. W. D. Simpson, program chairman, announced that the next meeting would be held on February 19 and would be past presidents' night. The secretary was instructed to write a congratulatory letter to the new Empire State Capital Chapter.

Mr. Simpson then introduced the speaker, John W. James, chief research engineer, McDonnell & Miller,

Inc., Chicago, Ill., who traced the gradual development of hot water heating from the old accepted gravity open system to the automatically controlled modern forced system, with special emphasis on operation and problems associated with increased temperature and pressure found in the closed system. He spoke of the heating tower in England whereby water used to cool the condensers of a powerstation is stored and used for heating a housing development. He showed slides of the different types of hot water heating systems, and at the same time, explained the differences between one and the others. Mr. James' talk was well presented and was followed by a question and answer period. Attendance 47.

• *ROCKY MOUNTAIN*—December 6, 1950. Pres. R. W. Petersen called the meeting to order at 7:55 p.m. in the Silver Wing Inn, Englewood, Colo., which was followed by the introduction of members and guests and the reading of the minutes of the previous meeting. Reports were given by the program and code committees.

The speaker of the evening, Hugh Terry, manager of Radio Station KLZ, Denver, Colo., was introduced and spoke on *The Future of Television in the Rocky Mountain Area.* Mr. Terry's discussion took the nature of answering questions interested people might ask. He indicated that the main reason why Denver does not now have telecasts is because there are too many applicants for the channels available. The medical and educational values of television were amply stressed and Mr. Terry estimated that telecasts would not probably begin in Denver for another 18 months. A short question and answer period followed and Mr. Terry was given a warm ovation for presenting an interesting talk. The meeting adjourned at 9:10 p.m. Attendance 59. Attendance ratio 0.53.

• *ST. LOUIS*—December 12, 1950. The meeting was called to order by C. H. Burnap, first vice president, at 7:30 p.m. in Town Hall and the minutes of the November 7 meeting were read and approved. Reports were given by the treasurer and the membership committee. Mr. Burnap announced that a speaker had not been selected as yet for the next meeting and announced that the Chapter had received a letter from A. V. Hutchinson, executive secretary of the Society, regarding the Society's role in legislative matters.

After a brief intermission, the meeting reconvened at which time C. A. Pickett, Chicago branch manager, Herman Nelson Div., American Air Filter Co., Inc., Moline, Ill. gave a talk on classroom unit ventilators and emphasized the new features and controls of these units. The meeting adjourned at 9:15. Attendance 50.

• *SOUTHERN CALIFORNIA*—January 17, 1951. Pres. L. J. Helms called the meeting to order following dinner in the Carolina Pines Restaurant. Cliff Casey of the *Technical Societies Council of Southern California* was introduced and gave a report on the progress of the Council toward its original purposes and its expanded program.

The speaker of the evening was F. H. Green, research engineer with Airesearch Mfg. Co., who spoke on *Survival at High Altitudes.* Mr. Green detailed the limits of altitude at which humans can remain functional as about 17,000 ft maximum and that at which humans can survive with the use of oxygen as about 40,000 ft maximum, stating that above that altitude, humans must be contained in sealed and pressurized cabins. He then explained, with a demonstrator, a cabin pressure differential control valve commonly used for controlling pressurized cabins. He further explained the necessity for cooling the cabin ventilation air when pressurizing at high altitudes and high speeds. He then explained, by use of a cutaway model, an expansion air turbine refrigeration unit and the working cycle as now used in high speed high altitude aircraft. Further amplification of the application engineering was given by slide examples of psychrometric charts. The meeting adjourned at 10:25 p.m. Attendance 96. Attendance ratio 0.47.

• *SOUTHERN CALIFORNIA*—December 20, 1950. Members and guests met in the Carolina Pines Restaurant for dinner, after which President Helms called the business meeting to order at 8:30 p.m. J. E. Haines, Minneapolis, Minn., and chairman of the Chapter Relations Committee, was introduced and spoke briefly concerning the work of his committee.

Maron Kennedy introduced the speaker, G. H. Walker, York Corp., San Francisco, Calif., who spoke on the advantages of well designed air conditioning systems. In his presentation he enlarged on the following points for consideration by the design engineer: correct design, design for easy maintenance, and advising owner on maintenance. Mr. Walker concluded his talk with the prediction that preventive maintenance service contracts for air conditioning and refrigeration plants will be increasingly demanded by purchasers. A discussion period followed the talk. Attendance 114.

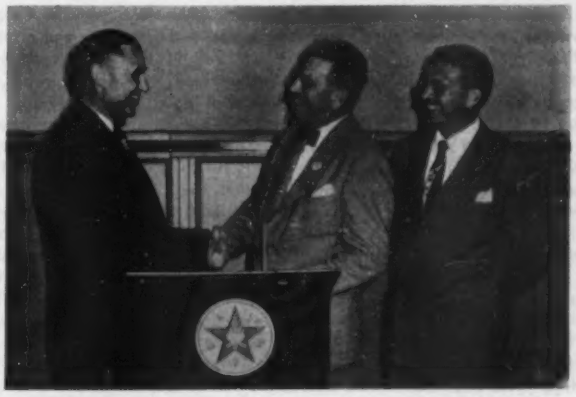
• *UTAH*—December 13, 1950. A. R. Curtis, vice president, was the presiding officer and called the meeting to order at 7:30 p.m. in the Doll House. The minutes of the November meeting were read and approved, which was followed by a brief discussion concerning the printing of the Chapter's roster.

The speaker of the evening was J. A. Ashton, president of Ashton Heating & Air Conditioning Co., Salt Lake City, who gave a very interesting talk on some of his warm air panel and perimeter heating jobs. The meeting adjourned at 8:50 p.m. Attendance 14.

• *WASHINGTON, D. C.*—January 17, 1951. This was a joint meeting with the Baltimore Chapter of ASHVE and the Baltimore-Washington, D.C., Section of the *ASRE*, which consisted in a trip in the afternoon to Friendship International Airport. The airport is completely air conditioned and the members were particularly interested in the air conditioning equipment.

At 6:00 p.m. the entire group assembled for a dinner and business meeting and following dinner, W. O. Kline of the *ASRE* gave the welcoming address. He pointed out that the refrigeration men and the heating and air conditioning men were meeting in a spirit of true friendship and not as competitors, and expressed the hope that there would be more joint meetings. F. M. Thuney and G. B. Priester, presidents of the Washington D.C. and Baltimore Chapters of ASHVE, respectively, made a few remarks when each was introduced.

Mr. Beavin, the speaker of the evening, was detained and his associate, G. E. Taylor, addressed the group on the construction of the Friendship Airport. He showed a series of slides taken during the construction and showed all types of equipment used during this period. After the showings of the slides, Mr. Beavin arrived and completed the talk and conducted a question and answer period.



(*L.* to *R.*) S. W. Beaty, incoming president of Shreveport Chapter, Lester T. Avery, president of ASHVE, and B. E. Segall, Jr., retiring president of Shreveport Chapter.

• *WASHINGTON, D. C.*—December 13. 1950. In the absence of President Thuney, R. K. Thulman, vice president of the Chapter, called the meeting to order in Naylor's Seafood Restaurant. A telegram was read from President Thuney expressing regret that he could not be with them and wishing them a happy holiday season and a happy and prosperous New Year. S. R. Allen spoke briefly concerning the joint meeting to be held in January with the Baltimore Chapter of ASHVE and the Baltimore-Washington, D. C., Section of *ASRE*.

Mr. Allen then introduced G. B. Priester, air conditioning engineer, Consolidated Gas, Electric Light & Power Co., Baltimore, Md., who spoke on *Trends and Troubles in Air Conditioning*. Before beginning his talk, Mr. Priester passed around copies of a mimeographed booklet containing a series of eight tables to which he referred during his talk. These data gathered into the tables represented a study of conditions in the Baltimore area covering about one and a half million population. However, the same fundamental data could be applied to Washington, D.C., and Philadelphia, Pa., as conditions are essentially alike. This represented *trends* in air conditioning and should be of value to any salesman trying to sell his products in cooling and air conditioning.

Mr. Priester stated that a study of these data would quickly reveal that the easiest customers to sell are food markets, restaurants and taverns. The largest potential market to sell is offices and stores. In his opinion the greatest selling efforts should be expended in offices and commercial applications, especially food stores and chain stores, where a lucrative market exists.

Concerning *troubles* in air conditioning, Mr. Priester was frank in telling some of the mistakes he had made and illustrated each problem on a blackboard and showed how each mistake was corrected. Following a question and answer period, the meeting adjourned. Attendance 43.

• *WESTERN NEW YORK*—January 8, 1951. Pres. J. H. Bryce called the meeting to order at 8:10 p.m. and the members introduced themselves and their guests. The minutes of the November and December meetings were read and approved. President Bryce introduced L. A. Harding, past president of the Society and the first president of the Western New York Chapter. Q. P. Thompson, delegate to the Technical Societies of Buffalo, gave a brief report on its activities.

H. P. Asmus introduced D. F. Bennett, manager of the Radiation and Unit Heater Department, Warren Webster Co., Camden, N. J., who spoke on *Baseboard Heating and Its Applications*. Mr. Bennett gave a brief history of baseboard heating from its inception in 1905, a simple pipe with a metal cover. The first tests were made on baseboard heating at the University of Illinois in 1925. Mr. Bennett pointed out the advantages of using low temperature radiation to cover all exposed walls of a building and the standard way used in piping same, such as two-pipe systems, one-pipe systems using diversion type fittings, and the series connected systems. He used slides to illustrate the many types of baseboard radiation, their applications, present day methods of calculations, installation of various types of systems, and piping of baseboard radiation. The talk was followed by an extensive discussion period and a standing vote of thanks was given to Mr. Bennett for a very interesting and educational evening. Attendance 40.

• *WISCONSIN*—January 8, 1951. Members and guests met in the

Engineers Society Building, Milwaukee, for dinner, after which H. F. Brinen, vice president, called the meeting to order and welcomed the members and guests. The minutes of the December meeting were read and approved and reports were given by various committee chairmen on the activities of their respective committees. A discussion was held concerning the revision of the Chapter's constitution and by-laws and a motion was passed authorizing the three members who proposed the change to submit a mimeographed copy of the revised constitution and by-laws for the consideration of the full membership. Vice President Brinen then read the letter which President Nunlist had written to the newly formed Empire State Capital Chapter. A colored film on Oregon was then shown through the courtesy of the Oregon Chapter in order to promote attendance at the Society's 1951 Semi-Annual Meeting in Portland.

E. A. Knab introduced the speaker, Albert Milnes, industrial manager, Sarco Co., Inc., New York, N. Y., who spoke on *Steam Traps, Their Characteristics, Construction & Application.* The physical characteristics of the various types of steam traps were shown with slides. Steam traps can be classified in two general groups — thermostatic and mechanical types. Thermostatic traps can be sub-divided in several groups, dependent upon the temperature and sensitive elements as all thermostatic traps depend on temperature variation for their operation. Mr. Milnes stated that, normally, thermostatic traps will pass condensate when the condensate temperature is from 10 to 35 deg below the saturated steam temperature. The thermostatic traps can be classified as balance pressure type, liquid expansion type and bimetallic type.

He stated that the mechanical type of steam trap depends upon some physical characteristic of the condensate for operation, such as density. Mechanical traps, he explained, can be classified as open-bucket type, inverted bucket type and float type, and it is common practice to combine both the thermostatic and mechanical types in the same steam trap. Mr. Milnes pointed out that the third type of steam trap available is the impulse or thermodynamic type. This trap depends upon steam velocity and the expansion of steam in the low pressure chamber for its operation. He further stated that no specific type of steam trap can satisfy all applications and engineering knowledge of the limitations and operations must be known before proper trap specifications can be used. Attendance 47.

FINANCIAL WORLD AWARD PRESENTED

O. W. Bynum, left, vice president in charge of sales of Carrier Corp., Syracuse, is shown at the Hotel Statler, New York, N. Y., receiving a bronze trophy on behalf of his company for the best annual report in the air conditioning and refrigeration industry for 1949. Awarding the trophy is Weston Smith, director of the Financial World annual report surveys.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month 86 applications for membership, including 13 student applications, 2 reinstatements; and 16 advancements have been received and the names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by March 30, 1951, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

ANDERSON, R. D., Partner, Anderson Brothers Engineering Co., Omaha, Nebr. REFERENCES: S. W. Black, W. B. Howard, M. K. Rush, Verne Simmonds.

BARR, E. E., Sales Engr., Surface Combustion Corp., Wichita, Kan. REFERENCES: W. M. Adams*, R. F. Bauer, E. C. Blood, A. H. Speer.

BEHRMANN, HANS, Mech. Engr., Ilg Electric Ventilating Co., Chicago, Ill. REFERENCES: Alexander Cowie*, H. C. Gotschall, R. I. Hanford*, L. E. Peterson*.

BERDISH, R. A., Owner, Berdish and Co., Detroit, Mich. REFERENCES: R. H. McGeorge, L. R. Johnson, I. W. Farri, W. L. Swadling.

*Non-Member

BLACKBURN, B. L., Engr., Fahnestock, Inc., Wichita, Kan. REFERENCES: R. F. Bauer, O. P. Bullock, E. G. Fahnestock, H. D. Speyer.

BLESSING, A. V., Partner, Blessing Heating Co., Flint, Mich. REFERENCES: W. G. Boales, A. P. Engelhart*, L. M. Smith, R. H. Young, Jr.

BODDINGTON, W. C., Sales Mgr., The James Morrison Brass Mfg. Co., Ltd., Toronto, Ont., Canada. REFERENCES: A. M. Clark, Ernest Fox, N. W. Kingsland, T. H. McLaren.

BOESE, D. M., Mgr., Heating Dept., Crane Co., Minneapolis, Minn. REFERENCES: T. C. Gianos, L. J. Krause, W. N. Parks, C. P. Petersen.

BRODERICK, F. J., District Sales Mgr., S. A. Armstrong Ltd., Toronto, Ont., Canada. REFERENCES: W. R. Blackhall, G. H. Hopper, A. T. Jones, William Philip.

BROWN, L. M., Chief Engr., R. J. Murray Co., Inc., Schenectady, N. Y. REFERENCES: W. M. Goddard*, H. A. King*, J. Ottenheimer*, R. B. Taylor.

CHAMPAGNE, K. E., Sales Repr., LeValley McLeod Inc., Olean, N. Y. REFERENCES: Charles Edleman*, G. H. Swart*, H. E. Sicker*, P. B. Orvis*.

CLARKE, W. D., Heating Engr., Conn. Light & Power Co., Waterbury, Conn. REFERENCES: R. C. Atherton, J. M. Atherton, R. L. Maher, W. M. Mulholland.

COLEMAN, H. L., Sales Specialist, Canadian General Electric Co., Toronto, Ont., Canada. REFERENCES: A. M. Clark, W. J. Coates, A. T. Jones, Ralph Ramsey.

CORSAR, ROBERT, Sales Engr., J. H. Ashdown Hardware Co., Ltd., Winnipeg, Man., Canada. REFERENCES: J. F. Bertram, H. A. Bestall*, M. W. McKenzie, E. H. Price.

CURRISE, W. F., Field Engr., American Blower Corp., Indianapolis, Ind. REFERENCES: I. W. Cotton, S. E. Fenstermaker, W. T. Miller, G. B. Supple.

DEAS, G. C. T., Chief Engr. & Mgr., Roofing Dept., Nebraska Sheet Metal & Roofing Contractors, Omaha, Nebr. REFERENCES: S. W. Black, G. W. Colburn, W. B. Howard, M. K. Rush.

DEMAREST, R. K., Jr., Mech. Engr., Wm. G. Lyles, Bissett, Carlisle & Wolff, Columbia, S. C. REFERENCES: E. T. Gorbandt, D. F. Lindstrom, F. A. Player, Charles Sockwell, Jr.

DI BENGA, F. J., Section Leader, C. J. Jeffreys, Cons. Engr., Montreal, Que., Canada. REFERENCES: A. E. Horsburgh, E. L. Montgomery, F. G. Phipps, S. W. Salter.

*Non-Member

DOLGNER, W. G., Head, Dept. of Mech. Engrg., Jensen and Keough, Detroit, Mich. REFERENCES: G. W. Akers, Marshall Bruce, L. A. Burch, R. L. Deppmann.

FEIGE, W. C., JR., Pres., W. C. Feige, Jr., Inc., Baltimore, Md. REFERENCES: E. S. Berngartt, A. M. Gompf, E. R. Kent, R. R. Poole.

FOULDS, G. G., Sales Engr., The Trane Co., Wichita, Kan. REFERENCES: R. F. Bauer, O. P. Bullock, W. L. Turner*, Charles Yoe.

FRAZIER, E. D., Sales Engr., Brownlaw's Inc., Winston-Salem, N. C. REFERENCES: E. G. Embree, R. O. McGary, J. M. Pleasants, J. A. Rice.

GNADE, L. E., Design and Layout, B. E. Landes, Cons. Engr., Des Moines, Ia. REFERENCES: B. E. Landes, D. C. Murphy, R. H. Schnell, D. E. Wells.

GREGORY, J. H., Sales Mgr., Canadian Blower & Forge Co., Ltd., Kitchener, Ont., Canada. REFERENCES: A. D. G. Baird, Alfred Brittain, Jr., R. S. Mathison, A. M. Clark.

GRICE, J. F., Mech. Engr., J. E. Greiner Co., Baltimore, Md. REFERENCES: E. L. Crosby, W. P. Flanigan, W. G. Robertson, Jr., R. F. Weisman.

HAEBICH, T. R., Asst. Mgr., Crane Co., Wichita, Kan. REFERENCES: D. M. Allen, O. P. Bullock, L. H. Johnson, Jr., E. E. Ralston.

HALL, G. C., Sr. Commercial Sales Engr., Florida Power Corp., St. Petersburg, Fla. REFERENCES: N. C. Ebaugh, R. J. Clark, R. M. Cox, T. R. Yarborough.

HALLOWELL, E. R., Chief Engr., Snell Refrigeration Supply Co., Dallas, Tex. REFERENCES: M. L. Brown, J. F. Moss, J. D. Poythress, E. J. Stern.

HAWLEY, F. E., Sales Repr., Crane Co., Omaha, Nebr., REFERENCES: O. J. Smith, J. G. Bierl, W. B. Howard, M. K. Rush.

HETTELSATER, D. R., Designer, Jones-Hettelsater Construction Co., Kansas City, Mo. REFERENCES: Carl Clegg, F. J. Schaad, F. N. Schaad, J. H. Traynor.

HICKEY, RAY, Owner, Hickey Sheet Metal & Furnace Co., Great Bend, Kan. REFERENCES: D. M. Allen, R. F. Bauer, F. C. Hoff, W. F. Ryan.

HJERPE, C. W., Estimator, A. J. Eckert Co., Inc., Albany, N. Y. REFERENCES: George Copeland*, W. J. Burns*, R. L. Miller, A. J. Offner.

INMAN, P. R., Designer & Estimator, The Dick Roberts Plumbing and Heating Co., Spokane, Wash. REFERENCES: H. A. Bickel, O. E. Bowers, L. E. Marque, T. P. Nau.

JOHNSON, H. W., Insulation Contr., Pacific Asbestos & Supply, Portland, Ore. REFERENCES: W. B. Hayes, T. E. Taylor, B. M. Thornburg, W. B. Morrison.

KANE, W. T., Sales Engr., John J. Nesbitt, Inc., New York, N. Y. REFERENCES: B. H. Lee, W. L. Fleisher, Jr., M. A. Queenin, T. M. Reed, Jr.

KINDRED, J. E., JR., Mech. Engr., W. L. Cassell, Mech. Engr., Kansas City, Mo. REFERENCES: W. L. Cassell, D. M. Allen, Carl Clegg, Henry Nottberg, Jr.

KRANTZ, C. P., Dist. Mgr., The Powers Regulator Co., Cincinnati, Ohio. REFERENCES: R. B. Barbara, A. G. Huelsmann, E. W. McNamee, R. F. Taggart.

KURZDORFER, R. D., Field Service Engr., A. M. Byers Co., San Francisco, Calif. REFERENCES: C. E. Bentley, H. V. Hickman, J. E. Murray, A. D. Sheere.

LACEY, T J., JR., Draftsman & Designer, Thomas Robertson & Co., Ltd., Montreal, Que., Canada. REFERENCES: F. A. Hamlet, G. E. Perras, G. H. Powell, W. W. Timmins.

MACNEILL, G. E., Head, Gordon E. MacNeill Assoc., Boston, Mass. REFERENCES: A. L. Hare, G. B. Torrens, W. H. Shipp, W. A. Williams.

MAHLER, MARTIN, Supvr. of Construction, D. A. Hopper, Jr., AIA Architect, Irvington, N. J. REFERENCES: H. F. Binford*, K. D. Brumbaugh*, O. R. Egge*, M. E. Runyon*.

McCALL, H. B., Mgr., Htg. Div., Siebert & Willis Inc., Wichita, Kan. REFERENCES: E. G. Fahnestock, J. W. Kice, Dean Olds, Charles Yoe.

MENICH, S. J., District Engr., Carrier Engineering Ltd., London, Ont., Canada. REFERENCES: M. S. Barker*, L. A. Book*, G. M. Burns*, G. B. Overend.

MILLER, R. B., Sales Repr., McDonnell & Miller, Inc., Toronto, Ont., Canada. REFERENCES: W. R. Blackhall, F. A. Hamlet, H. D. Henion, M. W. Shears.

MILLS, G. E., General Supt., R. E. Black, Bldg. Mgr., Wichita, Kan. REFERENCES: J. W. Jenner, Millard Simmons*, W. M. Turner*, H. M. Van Aucken*.

MILSTEAD, H. D., Owner, Milstead's, Peru, Nebr. REFERENCES: W. B. Howard, K. E. Martin, F. E. Prawl, M. K. Rush.

MORTON, H. J., Sales Repr., W. A. Case & Son Mfg. Co., Syracuse, N. Y. REFERENCES: R. R. Chur, B. C. Goodhue, R. L. Manier, H. K. Ormsby, Jr.

MURPHY, R. T., Sales Engr., Westerlin & Campbell Co., St. Paul, Minn. REFERENCES: A. B. Algren, J. V. Borry, G. M. Kendrick, E. A. Monies.

MYERS, K. A., Mgr., Htg. & Refrign. Div., County Seat Supply Co., Inc., White Plains, N. Y. REFERENCES: W. F.

JOURNAL SECTION

Hosmer, E. H. Lambert, H. E. Lucas, T. E. Scott*.

NEWMAN, T. C., Sales Engr., Smallcomb Electric Co., Los Angeles, Calif. REFERENCES: J. S. Earhart, A. J. Hess, C. T. Newman*, C. T. Smallcomb*.

OVERCASH, E. V., Sales Engr., Kirk Cousart & Associates, Charlotte, N. C. REFERENCES: Kirkpatrick Cousart, C. W. Hallenbeck, J. A. Rice, W. P. Wells.

OWEN, DOUGLAS, Engr., Giffels & Vallet, Inc., Detroit, Mich. REFERENCES: C. H. Baker, D. S. Falk, James Gadsden*, T. S. Lovell.

PALMER, R. W., Service Mgr., Schnurr & Kraemer Ltd., Kitchener, Ont., Canada. REFERENCES: D. H. Butler, R. A. Flake, Capel Templeman, L. C. West.

PECK, W. H., Jr., Mgr., Air Conditioning Div., Mosel & Terrell Plumbing Co., San Antonio, Tex. REFERENCES: L. C. Ferrell, L. H. Hornor, Jr., L. S. Pawkett, I. W. Wilke.

PERCIVAL, H. W., Vice Pres., Nebraska Sheet Metal Contractors, Inc., Omaha, Nebr. REFERENCES: S. W. Black, W. B. Howard, M. K. Rush, Verne Simmonds.

PLEWES, D. S., Sales Engr., Johnson Service Co., Philadelphia, Pa. REFERENCES: J. E. Hutchison, J. W. McElgin, S. E. Plewes, R. P. Schoenijahn.

PRAY, D. W., Partner, Pray Brothers, Wichita, Kan. REFERENCES: R. F. Bauer, L. H. Johnson, Jr., H. D. Speyer, Charles Yoe.

ROESING, J. P., Design and Application Engr., General Electric Distributors, General Heating and Cooling Co., Kansas City, Mo. REFERENCES: E. F. Cassing, John Deveraux*, Ed Rick*, C. W. Schumacher.

SADLER, V. L., Sales and Estimator, Sam L. Sadler Roofing & Sheet Metal Contractor, Uvalde, Tex. REFERENCES: H. J. Faller, L. C. Ferrell, L. H. Hornor, Jr., L. N. Mathis.

SAFFELL, PAUL, Mgr., Air Conditioning Div., Siebert & Willis, Inc., Wichita, Kan. REFERENCES: R. F. Bauer, E. G. Fahnestock, J. W. Kice, H. D. Speyer.

SKALLA, H. M., Design Engr., Oakle P. Bullock, Cons. Engr., Wichita, Kan. REFERENCES: R. F. Bauer, O. P. Bullock, R. F. Jamison, E. E. Ralston.

SOBOLEWSKI, E. A., Chief Engr., Floyd & Co., Cincinnati, Ohio. REFERENCES: I. G. Edwards, Vincent Hotze, H. W. Moore, H. E. Russel.

SPENCER, E. E., Sales Engr., Powers Regulator Co., Minneapolis, Minn. REFERENCES: J. W. Andeen*, O. E. Loberg, E. J. O'Donnell, L. B. Ritchey*.

STEVENS, CHARLES, Partner, Stevens & Grow, Los Angeles, Calif. REFERENCES: J. S. Earhart, F. M. Neal, J. F. Park, H. W. Smith, Jr.

*Non-Member

STEVENS, R. H., M. E. Associate, C. L. Toonder & Associates, Detroit, Mich. REFERENCES: Frank Laucomber*, C. F. Mally, J. R. Reisler*, C. L. Toonder.

STOCKMAN, C. E., Fuel & Heating Consultant, Anthracite Institute, Toronto, Ont., Canada. REFERENCES: J. O. Arrowsmith, G. P. Cooper, R. A. Leith, G. H. Tate*.

THYGERSON, R. J., Jr., Sales Engr., Chicago Conditionaire Co., Chicago, Ill. REFERENCES: H. G. Gragg, W. L. Long, H. C. Stevens, L. H. Streb.

TWINING, R. B., Asst. Prof., Drexel Institute of Technology, Philadelphia, Pa. REFERENCES: M. E. Barnard, Isadore Director, J. W. McElgin, E. K. Wagner.

VAN ORMAN, W. T., Research Engr., Goodyear Tire & Rubber Co., Akron, Ohio. REFERENCES: Lester T. Avery, D. A. Hammack, D. E. Humphrey, G. L. Tuve.

WOLENSKY, B. G., Sales Engr., General Oil Burner Co. & City Coal & Fuel Oil Co., Allentown, Pa. REFERENCES: C. L. Bowman, Celeste Perrotto*, Elmer Serfass*, Morris Wolensky*.

YORK, J. L., Asst. Prof., Dept. of Chemical and Metallurgical Engineering, University of Michigan, Ann Arbor, Mich. REFERENCES: G. G. Brown*, M. E. Farris*, D. L. Katz*, C. F. Kessler.

REINSTATEMENTS

JONES, F. C., Jr., Mech. Engrg. Partner, Butterworth & Co., Albany, Ga. REFERENCES: A. C. Bartlett*, W. L. Hunken, A. G. Mutimer, E. M. Sommerfield*.

SMITH, W. O., Pres., Aston Products, Inc., Detroit, Mich. REFERENCES: W. G. Boales, R. H. McGeorge, E. B. Root, E. T. Smith.

STUDENTS

IOWA STATE COLLEGE, Ames, Ia. CERTIFIED BY: J. F. Sandfort.
LOTHE, J. A.

McGILL UNIVERSITY, Montreal, Que., Canada. CERTIFIED BY: C. A. Robb*.
VALLIERES, R. H.

UNIVERSITY OF KENTUCKY, Lexington, Ky. CERTIFIED BY: Merl Baker
HOLLAND, W. L.
JACOBS, L. K.
KIRZINGER, R. L.
LAYMAN, F. L.
MAGEL, M. C.
MILLER, W. R.
REED, C. B., JR.
YOUNG, H. E.

UNIVERSITY OF TORONTO, Toronto, Ont., Canada. CERTIFIED BY: F. G. Ewens.
ALEXANDER, L. W.
MARSHALL, E. T.
WILCOX, G. F. M.

ADVANCEMENTS

BERNGARTT, E. S., Vice Pres., The George A. Peters Co., Baltimore, Md. REFERENCES: E. L. Crosby, H. D. Glaser, A. M. Gompf, E. J. Morris.

BORTZ, N. A., T/Sgt., U.S. Air Force, 29th Aircraft Rep. Sqdn., San Bernardino, Calif. REFERENCES: B. T. Bogard*, R. S. Oyer, W. N. White*, A. E. Williams*.

FENNELL, W. A., Partner, Fennell Co., Newport, Ky. REFERENCES: J. J. Bechtol, R. J. Hanschen, W. A. Juergens, W. L. Mayne.

GOODE, A. E., Mech. Engr., Robert and Company Associates, Atlanta, Ga. REFERENCES: R. S. Arnold, Sr., F. E. Baird, W. J. McKinney, Arvin Page.

LUTTRELL, D. A., Capt., Air Force, Langley AFB, Va. REFERENCES: W. H. Easton*, R. R. Irwin*, H. J. Murphy*, J. R. VonGonten*.

MANHEIM, J. L., Supvr., Retail Sales Dept., Washington Gas Light Co., Washington, D.C. REFERENCES: R. S. Dill, H. H. Hill, L. B. Nye, L. Ourusoff.

MAST, C. M., Pres., Heating & Air Conditioning Supply, Inc., Reno, Nev. REFERENCES: C. E. Bentley, R. C. Cushing, J. C. Hemingway, Jr., E. W. Howes.

MILLS, H. C., Owner, Hartzell C. Mills, St. Paul, Minn. REFERENCES: A. B. Algren, C. L. Benson, J. E. Haines, W. F. Uhl.

NEARINGBURG, ARTHUR, Br. Mgr., Sheldons Engineering Ltd., Galt., Ont., Canada. REFERENCES: R. P. Allsop, W. D. Sheldon, Jr., D. A. Stott, W. C. Watt.

PARK, P. S., Jr., Htg. & Vtg. Engr., C. A. Hawk, Jr., Cons. Engr., Pittsburgh, Pa. REFERENCES: C. L. Benn, C. A. Hawk, Jr., A. F. Metzger, H. E. Park.

PARSONS, R. A., Htg. Engr., Board of Water & Electric Light Commissioners, Lansing, Mich. REFERENCES: V. H. Hill, L. G. Miller, C. H. Pesterfield, K. E. Robinson.

PEAVY, B. A., Mech. Engr., National Bureau of Standards, Washington, D.C. REFERENCES: P. R. Achenbach, W. C. Baker, R. S. Dill, W. H. Martin*.

PELLER, LEONARD, Supervising Engr., United Engineers & Constructors, Inc., Philadelphia, Pa. REFERENCES: F. F. Pfeiffer, G. W. Powell, Jr., F. A. Tebo, Pierce Timmis.

STERN, R. M., Cons. Engr., Seattle, Wash. REFERENCES: C. A. Pangborn, W. B. Pride, C. W. May, J. D. Sparks.

THUNEY, F. M., Br. Mgr., Minneapolis-Honeywell Regulator Co., Washington, D.C. REFERENCES: A. C. Crawford, R. S. Dill, J. E. Haines, W. E. Kingswell.

VAN WAGENEN, W. C., Jr. Engr., Thomas H. Urdahl, Cons. Engr., Washington, D.C. REFERENCES: G. W. Campbell, W. T. Tiffin*, T. H. Urdahl, Edward Van Wagenen.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Headquarters: 51 Madison Ave., New York 10, N. Y. (Tel. Murray Hill 3 0291)

JOURNAL SECTION

OFFICERS

President.....Lauren E. Seeley
First Vice President.....Ernest Szekely
Second Vice President.....Reg P. Taylor
Treasurer.....Howard E. Sproull
Executive Secretary.....A. V. Hutchinson
Technical Secretary.....Carl H. Flink

COUNCIL

Lauren E. Seeley, *Chairman;* Ernest Szekely, *Vice Chairman.*

Three Years: John H. Fox, L. N. Hunter, Neil H. Peterson, Benjamin H. Spurlock, Jr.

Two Years: John E. Haines, John W. James, E. R. Queer, Graeme B. Supple.

One Year: Spencer W. Boyd, C. Rollins Gardner, J. Donald Kroeker, Charles O. Mackey, Lester T. Avery.

ADVISORY BOARD

Lester T. Avery, *Chairman;* Homer Addams, M. F. Blankin, S. E. Dibble, S. H. Downs, E. O. Eastwood, W. L. Fleisher, H. P. Gant, F. E. Giesecke, E. Holt Gurney, L. A. Harding, H. M. Hart, C. V. Haynes, D. D. Kimball, G. L. Larson, S. R. Lewis, J. F. McIntire, A. J. Offner, F. B. Rowley, A. E. Stacey, Jr., G. L. Tuve, A. C. Willard, C.-E. A. Winslow and B. M. Woods.

COUNCIL COMMITTEES

Executive: Ernest Szekely, *Chairman;* Reg P. Taylor, Howard E. Sproull.

Finance: Reg P. Taylor, *Chairman;* John W. James, Neil H. Peterson, Howard E. Sproull, *Ex-Officio.*

Ways and Means: John W. James, *Chairman;* Irwin W. Cotton, John E. Haines, Charles E. Price, Reg P. Taylor.

Membership: C. Rollins Gardner, *Chairman;* John E. Haines, J. Donald Kroeker.

Program and Papers: E. R. Queer, *Chairman;* John H. Fox, Charles O. Mackey.

Standards: Graeme B. Supple, *Chairman;* L. N. Hunter, Benjamin H. Spurlock, Jr.

GENERAL COMMITTEES

Admission and Advancement: Glen D. Winans, *Chairman (one year);* Arthur W. Edwards *(two years);* Roswell Farnham *(three years).*

Publication: Theodore F. Rockwell, *Chairman;* Ralph P. Cook, Frank W. Hutchinson.

Guide: Peter B. Gordon, *Chairman;* Nathaniel Glickman, Peter J. Marschall, *(one year);* David B. Anderson, Burgess H. Jennings, Wayne E. Long *(two years);* Warren S. Harris, Frank J. Nunlist, Jr., Carl D. Shields *(three years).*

Charter and By-Laws: Howard E. Sproull, *Chairman;* Edward L. Crosby, George W. F. Myers.

F. Paul Anderson: Ernest Szekely, *Chairman;* Robert L. Blanding, Merrill F. Blankin, Joseph A. Cutler, Alfred E. Stacey, Jr.

Committee on Research: I. W. Cotton, *Chairman;* R. S. Dill, *Vice Chairman;* Cyril Tasker, *Director of Research.*

Three Years: A. B. Algren, John Everetts, Jr., T. H. Smoot, Thomas A. Walters, William N. Witheridge.

Two Years: Carl F. Boester, Robert C. Cross, Richard S. Dill, Arthur J. Hess, Harold A. Lockhart.

One Year: Irwin W. Cotton, Nathaniel Glickman, Walter A. Grant, L. N. Hunter, Richard D. Madison.

Technical Advisory Committees

Air Cleaning: R. S. Farr, *Chairman;* R. B. Crepps, R. S. Dill*, L. L. Dollinger, Jr., O. C. Eliason, C. D. Graham, A. B. Hubbard, G. F. Landgraf, K. W. MacKenzie, Arthur Nutting, G. W. Penney, C. B. Rowe, R. P. Warren, R. D. Wood.

Air Distribution: Ernest Szekely, *Chairman;* N. E. Berry, H. F. Brinen, R. M. Conner, S. H. Downs, Linn Helander, F. B. Holgate, W. O. Huebner, W. W. Kennedy, J. N. Livermore, R. D. Madison*, G. E. McElroy, L. G. Miller, D. W. Nelson, G. B. Priester, C. H. Randolph, T. H. Troller, G. L. Tuve.

Combustion: T. H. Smoot, *Chairman;* P. R. Achenbach, R. B. Engdahl, L. N. Hunter*, R. C. Johnson, W. B. Kirk, S. J. Levine, H. R. Limbacher, A. A. Marks, J. W. Miller, W. M. Myler, Jr., E. A. Norman, Jr., K. O. Schlentner, R. K. Thulman, E. C. Webb, J. A. Wilson, D. L. Wooden.

Cooling Load: W. E. Zieber, *Chairman;* W. F. Friend, R. H. Heilman, H. W. Heisterkamp, R. C. Jordan, F. A. Joy, C. F. Kayan, J. N. Livermore, R. H. Lock, C. O. Mackey, J. P. Stewart.

Corrosion: L. F. Collins, *Chairman;* A. S. Gates, Jr., A. E. Griffin, E. W. Guernsey, A. J. Hess*, H. A. Pray, F. N. Speller.

Heat Flow Through Glass: R. A. Miller, *Chairman;* A. B. Algren*, W. J. Arner, A. H. Baker, F. L. Bishop, Jr., R. D. Blum, J. E. Frazier, J. S. Herbert, E. R. Koppel, D. R. Muir, F. W. Preston, W. C. Randall, C. A. Richardson, Vic Sanders, H. B. Vincent.

Heat Pump: R. C. Jordan, *Chairman;* E. R. Ambrose, R. D. Blum, C. F. Boester*, F. R. Ellenberger, W. F. Friend, C. F. Kayan, E. N. Kemler, J. D. Kroeker, E. P. Palmatier, E. B. Penrod, S. S. Sanford.

Heating Load: A. I. Brown, *Chairman;* R. A. Biggs, R. S. Dill*, A. S. Griswold, W. S. Harris, J. M. Hartman, H. A. Lockhart*, L. G. Miller, T. F. Rockwell, S. I. Rottmayer, M. W. Shears.

Hot Water and Steam Heating: J. W. James, *Chairman;* H. C. Day, W. S. Harris, L. N. Hunter*, A. T. Jones, E. G. Keller, H. A. Lockhart*, M. W. McRae, S. K. Smith, Benjamin Spieth, M. H. Westerberg.

Human Calorimetry: G. L. Tuve, *Chairman;* E. F. DuBois, M.D., Nathaniel Glickman*, J. D. Hardy, M.D., E. R. Queer, L. E. Seeley, C. P. Yaglou.

Industrial Ventilation: W. N. Witheridge*, *Chairman;* A. D. Brandt, J. H. Clarke, R. B. Foley, W. C. L. Hemeon, W. O. Huebner, C. W. Johnson, J. M. Kane, M. G. Kershaw, L. L. Lewis, G. E. McElroy, H. A. Mosher, B. F. Postman, K. E. Robinson, B. R. Small, W. M. Wallace, II, R. P. Warren, H. E. Ziel.

Insulation: M. W. Keyes, *Chairman;* R. E. Backstrom, C. B. Bradley, P. D. Close, R. B. Crepps, N. B. Hutcheon, W. A. Knudson, H. E. Lewis, E. R. Queer; H. E. Robinson, Vic Sanders, T. D. Stafford, L. V. Teesdale, R. K. Thulman, P. M. Woodworth.

Odors: T. H. Urdahl, *Chairman;* L. H. Beck, N. E. Berry, W. V. Consolazio, C. L. Fay, W. A. Grant*, E. P. Heckel, G. W. Mrek, Amos Turk, W. N. Witheridge*.

Panel Heating and Cooling: P. B. Gordon, *Chairman;* A. B. Algren*, John Everetts, Jr.*, L. N. Hunter*, J. W. James, J. S. Locke, S. K. Smith.

*Member of Committee on Research

Group A—Heat Distribution Within and Behind the Panel: A. B. Algren*, *Chairman;* R. A. Biggs, R. S. Dill*, H. L. Flodin, F. E. Giesecke, W. S. Harris, J. H. Hart, C. F. Kayan, G. D. Lain, R. L. Maher, D. L. Mills, C. W. Nessell, P. S. Park, F. E. Parsons, S. I. Rottmayer, R. T. Schoerner, E. E. Scott, S. K. Smith, R. K. Thulman, S. M. VanKirk, W. J. Widmer, G. L. Wiggs, L. H. Yeager.

Group B—Heat Transfer Between the Panel and the Space: J. W. James, *Chairman;* C. M. Ashley, C. F. Boester*, Linn Helander, A. L. Jaros, Jr., H. A. Lockhart*, W. E. Long, C. O. Mackey, R. A. Miller, G. W. Penney, H. P. Randolph, J. M. van Nieukerken, H. B. Wheeler.

Group D—Controls: J. S. Locke, *Chairman;* A. B. Algren*, H. W. Alyea, Louis Barfus, S. D. Browne, R. L. Campbell, C. M. Garner, W. J. Hajek, A. J. Keating, W. H. Kliever, H. T. Kuczra, J. F. McCauley, P. F. Neese, J. K. M. Pryke, C. W. Signor, N. D. Skinner, E. F. Snyder.

Physiological Research: M. K. Fahnestock, *Chairman;* Thomas Bedford, A. R. Behnke, Cap., MC, USN, E. W. Brown, M.D., A. C. Burton, M.D., E. F. DuBois, M.D., A. P. Gagge, Lt. Col., MCS, USAF, Nathaniel Glickman*, F. K. Hick, M.D., R. W. Keeton, M.D., D. H. K. Lee, M.D., Charles Sheard, C. L. Taylor, C.-E. A. Winslow.

Sensations of Comfort: C. S. Leopold, *Chairman;* Lester T. Avery, John Everetts, Jr.*, M. K. Fahnestock, Nathaniel Glickman*, W. A. Grant*, A. J. Hess*.

Sorbents: John Everetts, Jr.*, *Chairman;* G. C. F. Asker, I. W. Cotton*, F. C. Dehler, A. S. Gates, Jr., E. W. Gifford, H. W. Heisterkamp, E. R. McLaughlin, J. C. Patterson, G. L. Simpson, F. J. Swaney.

Sound Control: T. A. Walters*, *Chairman;* C. M. Ashley, P. H. Geiger, Sidney Gordon, W. F. Hagen, H. C. Hardy, E. M. Herrmann, F. B. Holgate, G. C. Kerr, M. W. Keyes, R. D. Madison*, T. H. Troller, George Wohlberg.

Weather Design Conditions: W. M. Wallace, II, *Chairman;* H. S. Birkett, P. D. Close, R. S. Dill*, F. J. Friedman, W. L. Holladay, H. K. McCain, L. S. O'Bannon, T. H. Urdahl.

SPECIAL COMMITTEES

International Joint Committee on Psychrometric Data: Dr. Baldwin M. Woods, Berkeley, Calif., *Chairman;* B. A. Dmitrieff, New York, N. Y., *Secretary;* H. H. Bruce, London; G. A. Bull, London; C. S. Cragoe, Washington, D. C.; John A. Goff, Philadelphia; L. P. Harrison, Washington, D. C.; T. J. G. Henry, Toronto; B. H. Jennings, Evanston, Ill.; Dr. F. G. Keyes, Cambridge, Mass.; R. F. Legget, Ottawa; S. G. Rinon, Washington, D. C.; P. A. Sheppard, London; J. L. York, Ann Arbor, Mich.

Public Relations: Charles E. Price, *Chairman;* George La Roi, Howard W. Pound, Oliver J. Prentice, J. Rexford Vernon.

Nominating: A. J. Hess, Los Angeles, Calif., *Chairman;* B. L. Evans, St. Louis, *Secretary;* P. R. Achenbach, Washington, D.C.; F. W. Chambers, Toronto, Ont.; I. W. Cotton, Indianapolis; C. B. Gamble, New Orleans; Leo Garneau, Montreal, Que.; D. M. Hummel, New Haven, Conn.; E. H. Langdon, Seattle; A. E. Stacey, Jr., Syracuse, N.Y.; G. L. Tuve, Cleveland. *Alternates:* P. I. Marschall, Chicago; W. M. Wallace, II, Durham, N.C.

JOURNAL SECTION

OFFICERS OF LOCAL CHAPTERS AND STUDENT BRANCHES

(44 Chapters—11 Student Branches)

● **ATLANTA:** Organized 1937. Headquarters, Atlanta, Ga. Meets, Second Monday. PRESIDENT, E. K. Jamison, P.O. Box 1248, Atlanta, Ga. SECRETARY, G. B. Hightower, 545 Piedmont Ave., N.E., Atlanta.

● **BALTIMORE:** Organized 1949. Headquarters, Baltimore, Md. Meets, Third Wednesday. PRESIDENT, G. B. Priester, 1101 Lexington Bldg., Baltimore 3. SECRETARY, N. L. Spinelli, 310 N. Gay St., Baltimore 2.

● **CENTRAL NEW YORK:** Organized 1944. Headquarters, Syracuse, N. Y. PRESIDENT, A. L. Jones, Rm. 612, Syracuse Kemper Bldg., Syracuse 2. SECRETARY, H. K. Ormsby, 205 S. Townsend St., Syracuse 2.

● **CENTRAL OHIO:** Organized 1944. Headquarters, Columbus, Ohio. Meets, Third Monday. PRESIDENT, H. G. Hays, 851 W. Third Ave., Columbus 8. SECRETARY, A. D. Bogen, 330-34 E. Livingston Ave., Columbus 15.

● **CINCINNATI:** Organized 1932. Headquarters, Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, E. W. McNamee, 1729 John St., Cincinnati 14. SECRETARY, J. J. Bechtol, R. R. 14, Box 216, Cincinnati 11.

● **CONNECTICUT:** Organized 1940. Headquarters, New Haven, Conn. Meets, Third Thursday. PRESIDENT, D. M. Hummel, 20 Ashmun St., New Haven. SECRETARY, G. F. Nieske, 794 Bee St., Meriden.

● **DELTA:** Organized 1939. Headquarters, New Orleans, La. Meets, Second Tuesday. PRESIDENT, Ralph Elizardi, 3144½ St. Charles Ave., New Orleans 12. SECRETARY, H. L. Salaun, 317 Baronne St., New Orleans.

● **GOLDEN GATE:** Organized 1937. Headquarters, San Francisco, Calif. Meets, First Thursday. PRESIDENT, R. C. Cushing, 1136 Howard St., San Francisco 3. SECRETARY, T. J. White, 625 Market St., San Francisco 5.

● **ILLINOIS:** Organized 1906. Headquarters, Chicago, Ill. Meets, Second Monday. PRESIDENT, P. J. Marschall, 14th & Sheridan, North Chicago, Ill. SECRETARY, G. V. Zintel, 1217 W. Washington Blvd., Chicago 7.

● **INDIANA:** Organized 1943. Headquarters, Indianapolis, Ind. Meets, Fourth Friday. PRESIDENT, C. F. A. Locke, 111 E. 34th St., Indianapolis 5. SECRETARY, J. T. Hardin, 3720 N. Pennsylvania St., Apt. 15, Indianapolis.

● **INLAND EMPIRE:** Organized 1950. Headquarters, Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, W. C. Vradenburg, Hutton Bldg., Spokane. SECRETARY, R. J. Harris, 116 N. Division St., Spokane 8.

● **IOWA:** Organized 1940. Headquarters, Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, R. S. Stover, Kresge Bldg., Marshalltown, Ia. SECRETARY, R. H. Schnell, 1617 33rd St., Des Moines 11.

● **KANSAS CITY:** Organized 1917. Headquarters, Kansas City, Mo. Meets, First Monday. PRESIDENT, W. E. Howarth, 101 W. 11th St., Kansas City 6. SECRETARY, W. A. Reichow, 7351 Madison, Kansas City 5.

● **MANITOBA:** Organized 1935. Headquarters, Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, C. M. Fleming, 116 Osborne St., Winnipeg, Man. SECRETARY, W. J. Atkinson, 812 Boyd Bldg., Winnipeg.

● **MASSACHUSETTS:** Organized 1912. Headquarters, Boston, Mass. Meets, Third Tuesday. PRESIDENT, D. W. Blair, 87 Withington Rd., Newtonville 60. SECRETARY, W. A. Williams, 10 Sevinor Rd., Marblehead.

● **MEMPHIS:** Organized 1944. Headquarters, Memphis, Tenn. Meets, Third Monday. PRESIDENT, C. S. Fischer, 367 Adams Ave., Memphis. SECRETARY, A. T. Bevil, 212 Robinson Bldg., 160 Union, Memphis 3.

● **MIAMI VALLEY:** Organized 1950. Headquarters, Dayton, Ohio. PRESIDENT, R. J. Perkins, 621 Third Bldg., Dayton 2. SECRETARY, W. R. Budde, 305 Leo St., Dayton 4.

● **MICHIGAN:** Organized 1916. Headquarters, Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, C. F. Donohoe, 2000 Second Ave., Detroit 26. SECRETARY, R. H. Oberschulte, 316 McKerchey Bldg., Detroit 1.

● **MINNESOTA:** Organized 1918. Headquarters, Minneapolis, Minn. Meets, First Monday. PRESIDENT, G. M. Kendrick, 402 Essex Bldg., Minneapolis 2. SECRETARY, J. V. Borry, 6433 Second Ave., Minneapolis 19.

● **MONTREAL:** Organized 1936. Headquarters, Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, R. R. Noyes, Rm. 674, Sun Life Bldg., Montreal. SECRETARY, T. G. Anglin, 540 Prince Albert Ave., Montreal 6.

● **NEBRASKA:** Organized 1940. Headquarters, Omaha, Neb. Meets, Second Tuesday. PRESIDENT, G. W. Colburn, 2865 Ida St., Omaha. SECRETARY, S. W. Black, 18th and Harney Sts., Omaha.

● **NEW YORK:** Organized 1911. Headquarters, New York, N. Y. Meets, Third Monday. PRESIDENT, Carl F. Kayan, Columbia University, Morningside Hgts., New York 27. SECRETARY, Carl H. Plink, Room 3000, 51 Madison Ave., New York 10.

● **NORTH CAROLINA:** Organized 1939. Headquarters, Durham, N. C. Meets, Quarterly. PRESIDENT, R. O. McGary, P.O. Box 1755, Charlotte. SECRETARY, J. A. Rice, 718 E. Worthington Ave., Charlotte.

● **NORTH TEXAS:** Organized 1938. Headquarters, Dallas, Tex. Meets, Third Monday. PRESIDENT, R. G. Lyford, 2415 N. Pearl St., Dallas. SECRETARY, P. N. Vinther, 929 Mercantile Securities Bldg., Dallas 1.

● **NORTHEASTERN OKLAHOMA:** Organized 1948. Headquarters, Tulsa, Okla. PRESIDENT, R. F. Shoemaker, 1136 S. Peoria, Tulsa. SECRETARY, F. M. Thomas, 1325 E. 35th Pl., Tulsa 5.

● **NORTHERN OHIO:** Organized 1916. Headquarters, Cleveland, Ohio. Meets, Second Monday. PRESIDENT, W. M. Rowe, 1302 Sweetland Bldg., Cleveland 15. SECRETARY, G. V. Parmelee, 94 Solon Rd., Chagrin Falls.

● **OKLAHOMA:** Organized 1935. Headquarters, Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, R. E. Swan, 2 N. W. Sixth St., Oklahoma City. SECRETARY, W. J. Collins, Jr., 2240 Oklahoma Natural Gas Bldg., Oklahoma City.

● **ONTARIO:** Organized 1922. Headquarters, Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, J. H. Fox, Vanderhoof Ave., Leaside, Toronto 17. SECRETARY, H. R. Roth, 57 Bloor St., W., Toronto, Ont.

● **OREGON:** Organized 1939. Headquarters, Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, R. C. Chewning, 402 Failing Bldg., Portland 4. SECRETARY, Dick Blankenship, 725 Cascade Bldg., Portland 4.

● **PACIFIC NORTHWEST:** Organized 1928. Headquarters, Seattle, Wash. Meets, Second Tuesday. PRESIDENT, C. A. Pangborn, 312 2nd and Cherry Bldg., Seattle 4. SECRETARY, W. D. Pride, 3111 Dose Terrace, Seattle 44.

● **PHILADELPHIA:** Organized 1916. Headquarters, Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, J. W. McElgin, 1926 Lycoming Ave., Overlook Hills, Willow Grove. SECRETARY, L. M. Church, 12 S. 12th St., Philadelphia 7.

● **PITTSBURGH:** Organized 1919. Headquarters, Pittsburgh, Pa. Meets, Second Monday. PRESIDENT, A. F. Metzger, 435 Sixth Ave., Pittsburgh 22. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

● **ROCKY MOUNTAIN:** Organized 1944. Headquarters, Denver, Colo. Meets, First Wednesday. PRESIDENT, R. W. Petersen, 2115 S. Gilpin St., Denver 10. SECRETARY, F. C. Von Rosenberg, 1875 S. Cook St., Denver.

● **ST. LOUIS:** Organized 1918. Headquarters, St. Louis, Mo. Meets, First Tuesday. PRESIDENT, J. S. Rosebrough, 25 Rosemont Ave., Webster Groves 19. SECRETARY, L. L. Hamig, 1706 Olive St., St. Louis 3.

● **SHREVEPORT:** Organized 1948. Headquarters, Shreveport, La. Meets, Third Thursday. PRESIDENT, S. W. Beaty, P.O. Box 1734, Shreveport 4, La. SECRETARY, W. S. Evans, 617 Ardis Bldg., Shreveport.

● **SOUTH TEXAS:** Organized 1938. Headquarters, Houston, Tex. Meets, Third Friday. PRESIDENT, H. W. Broadwell, 2201 Texas Ave., Houston. SECRETARY, C. L. Fleming, 805-A, M & M Bldg., Houston.

● **SOUTHERN CALIFORNIA:** Organized 1930. Headquarters, Los Angeles, Calif. Meets, Third Wednesday. PRESIDENT, L. J. Helms, 3357 Fairmount Ave., La Crescenta, Calif. SECRETARY, J. S. Earhart, 2734 Fleur Dr., San Marino 9, Calif.

● **SOUTHWEST TEXAS:** Organized 1946. Headquarters, San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, I. W. Wilke, P.O. Box 1154, Austin. SECRETARY, D. E. Locher, Box 949, 224 S. Staples St., Corpus Christi.

● **UTAH:** Organized 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. PRESIDENT, R. H. East, 1086 E. 21st St., Salt Lake City. SECRETARY, D. R. Wilde, 204 Dooly Bldg., Salt Lake City 1.

● **VIRGINIA:** Organized 1946. Headquarters, Norfolk, Va. Meets Third Wednesday. PRESIDENT, J. F. Boventon, 400 W. 24 St., Norfolk 8. SECRETARY, J. E. Harding, Apt. R-2, St. James Terrace, Newport News.

● **WASHINGTON, D. C.:** Organized 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. PRESIDENT, F. M. Thuney, 1919 K St., N. W., Washington 6. SECRETARY, I. M. Bortman, 422 Luray Pl., N. W., Washington 10.

● **WESTERN MICHIGAN:** Organized 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, K. E. Robinson, 211 Smith Ave., Lansing 10. SECRETARY, F. W. Brundage, 512 N. Park St., Kalamazoo 11.

● **WESTERN NEW YORK:** Organized 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. PRESIDENT, J. H. Bryce, 120 W. Tupper St., Buffalo. SECRETARY, C. W. Stone, 503 Franklin St., Buffalo 2.

● **WISCONSIN:** Organized 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. PRESIDENT, F. J. Nunlist, Jr., 2005 W. Oklahoma Ave., Milwaukee 7. SECRETARY, N. E. Hill, 122 N. Hartwell Ave., Waukesha, Wis.

Student Branches

● **COLLEGE OF CITY OF NEW YORK:** Organized 1949. Headquarters, New York, N. Y. PRESIDENT, Seymour Weinberg, 2147 72nd Street, Brooklyn 4. SECRETARY, Benjamin Karp, 524 Berriman St., Brooklyn 8.

● **LOUISIANA POLYTECHNIC INSTITUTE:** Organized 1949. Headquarters, Ruston, La. PRESIDENT, H. A. Parker, Box 359, Tech Station, Ruston, La. SECRETARY, E. L. Lentz, Box 443, Tech Station, Ruston.

● **NORTH CAROLINA STATE COLLEGE:** Organized 1948. Headquarters, Raleigh, N. C. PRESIDENT, L. R. Wensil, 409 N. Church St., Concord. SECRETARY, V. V. Crews, 29 "D" St., Westhaven.

● **OKLAHOMA A. & M. COLLEGE:** Organized 1950. Headquarters, Stillwater, Okla. PRESIDENT, R. F. Mossman, 5 Belvoir, Vet Village, Stillwater. SECRETARY, G. J. Martinez, 410 West Elm, Stillwater.

● **OREGON STATE COLLEGE:** Organized 1949. Headquarters, Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. J. Kenner, Jr., 645 N. 4th, Corvallis. SECRETARY, J. M. Templer, 720 Kings Rd., Corvallis.

● **PURDUE UNIVERSITY:** Organized 1948. Headquarters, W. Lafayette, Ind. CHAIRMAN, John Harrell, 325 S. Chauncey, W. Lafayette, Ind. SECRETARY, Miss June Cox, 403 Maple, W. Lafayette, Ind.

● **TEXAS A. & M. COLLEGE:** Organized 1946. Headquarters, College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4054, College Station, Tex. SECRETARY, W. C. Haggard, Box 5227, College Station.

● **UNIVERSITY OF DETROIT:** Organized 1949. Headquarters, Detroit, Mich. Meets, First Tuesday. PRESIDENT, L. M. Blanchette, 2245 Holcomb, Detroit 14. SECRETARY, S. H. Kosinski, 4439-30th, Detroit 10.

● **UNIVERSITY OF KANSAS:** Organized 1949. Headquarters, Lawrence, Kans. PRESIDENT, J. L. Williams, 5278 Central, Kansas City, Mo. SECRETARY, R. C. Umholtz, 2732 Michigan St., Topeka, Kans.

● **UNIVERSITY OF TEXAS:** Organized 1949. Headquarters, Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, W. A. Cox, 360-D Deep Eddy Apts., Austin. SECRETARY, M. F. Klevar, 1801 N. Congress, Austin.

● **UNIVERSITY OF TORONTO:** Organized 1951. Headquarters, Toronto, Ont. CHAIRMAN, H. F. Spragg, 35 Harrison Ave., Aurora, Ont. SECRETARY, J. E. G. Blaiklock, 23 Isabella St., Toronto 5, Ont.

THE CASE OF THE *Incredulous Owner!*

JOHN VINCENT ANDERSON A·I·A ARCHITECT

ROUTE 2. WOODSTOCK ILLINOIS • PHONE • CRYSTAL LAKE 1328 M-2

Fitzgibbons Boiler Co. Inc.,
c/o Maxwell F. May, Inc.,
228 N. LaSalle Street,
Chicago 1, Illinois.

September 23, 1950

Dear Sirs:

A recent efficiency test on my Fitzgibbons 403 Boiler-Burner unit reached such a high figure that I had it rechecked. The first test results were:

1. ..... Efficiency 76%
2. ..... " 77%
3. ..... " 81%
4. ..... " 83%

Assuming both latter tests impossibly high, I asked for another test. With two eye witnesses for each reading, the final result gave an efficiency of 81%.

By comparison, the same tests were made on a previous job, same oil and same conditions, but another type of boiler, with a resulting efficiency of 60%.

Needless to say I am perfectly satisfied and will continue to specify Fitzgibbons boilers.

Very truly yours,
John Vincent Anderson

Four sizes 400 to 900 sq. ft. steam (SBI net rating). Available with or without oil burner. Supplies year 'round service hot water automatically, with no storage tank needed.

The Fitzgibbons "400" Series is a boiler that makes friends with architect, builder, heating contractor, owner. It is a safe boiler to specify, an easy boiler to install, an outstandingly economical boiler to operate.

IF YOU WANT THE FACTS

about this Fitzgibbons "400" Series steel boiler with its famous Tanksaver® coil, its A.S.M.E. Code steel construction, its hydrostatic test, its guaranteed SBI rating, and the reputation of a boiler company in business since 1886, mail the coupon today for catalog.

Write for the bulletin with complete data.

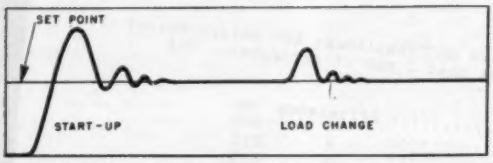
65th Anniversary
MOST ECONOMICAL IN FUEL
THE FITZGIBBONS BOILER
1886 - 1951

Fitzgibbons Boiler Company, Inc.

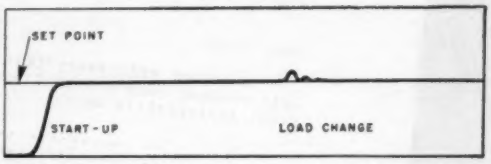
101 PARK AVENUE, NEW YORK 17, N. Y.

Manufactured at:* OSWEGO, N. Y.** ***Sales Branches in Principal Cities

ORDERS POURING
TAYLOR TRANSET*



(A) Process curve obtained by Conventional Controller with Automatic Reset.

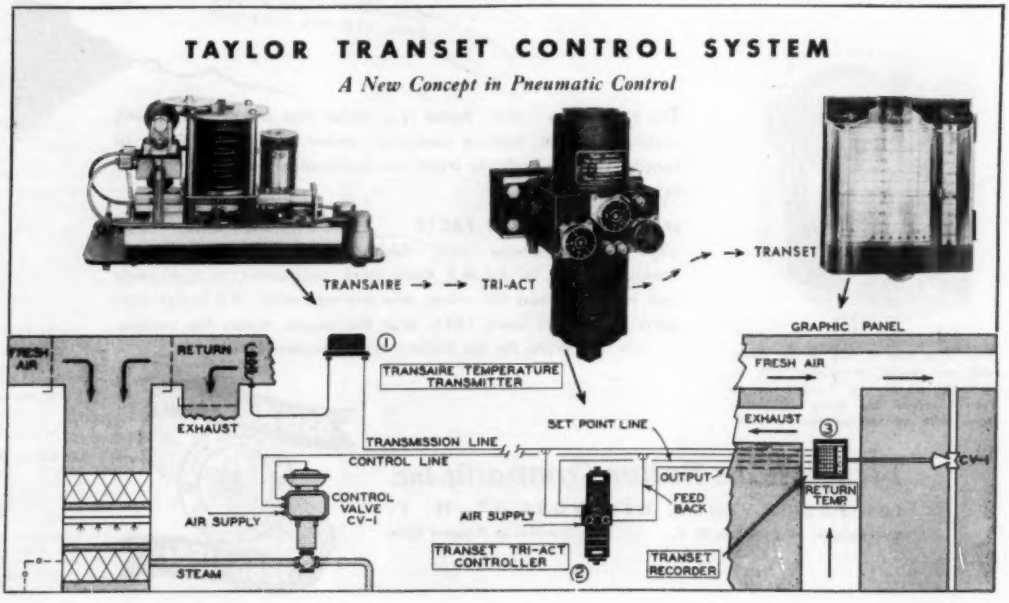


(B) Result produced by TRANSET TRI-ACT Controller under same conditions as "A".

If you want to eliminate overpeaking on start-up . . . If you want to reduce the effect of load changes —

You ought to have at least one of these systems on test so that you'll know from first-hand experience how this new control circuit takes the evils out of Automatic Reset and gives the benefits of Rate Action with *stability*.

If you are engineering any new job, call in Taylor *right now*. Because with this new System you can specify the exact quality of control you want in advance. Components of the System can be put together like building blocks to meet final needs.



IN FOR THE NEW CONTROL SYSTEM

New Concept in Pneumatic Control is talk of Industry

THE whole industry is buzzing about the benefits of Taylor's new TRANSET Control System. Orders are literally pouring into Rochester. This system is an entirely new concept in pneumatic control. It gives closer control than ever before possible under the most adverse operating conditions. It brings the air conditioning industry two advantages found in no other control system on the market today:

1. Compensation for inherent lags, always a problem in measuring air temperatures, by Speed-Act* in TRANSAIRE* Transmitters.

2. Faster and more stable control . . . rate action ahead of automatic reset in the TRI-ACT* Controller.

The Taylor TRANSET Control System combines: (1) TRANSAIRE, the force-balance temperature or pressure transmitters which have created new standards in measuring dynamic, or changing, temperatures and pressures. (The System works equally well with all types of transmitters.) **(2)** TRI-ACT, the Controller which combines a wider range of response adjustments, an increased capacity relay air valve, and a new control circuit, to take advantage of the faster measuring systems. Can be locally or panel mounted. **(3)** TRANSET Recording Receiver, fits 3⅞" x 4½" panel opening, gives continuous 30-day chart record with 3 hours visible —especially important features are: remote settings of control point, automatic-to-manual control, and instant check on controller performance and control valve position. Also available as an indicator.

Ask your Taylor Field Engineer or write to Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada.

HERE'S HOW YOU BENEFIT:

1—*More Accurate Measurement*
2—*Closer Control*
3—*Higher Efficiency*
4—*Start-Up With No Overpeaking*
5—*Faster Recovery On Load Changes*
6—*30-Day Chart Record On 4¾" x 5" Panel Space*
7—*Permits Specifying Instrumentation Before Finalizing Process Design Details.*

SEND FOR:

ASME Paper #50-A-100. It tells the theory of TRI-ACT Control.

Taylor Bulletin 98097. It gives details of design and construction.

*Trade-Mark

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

POINTS TO CHECK ✓

IN YOUR COOLING TOWER INVESTMENT

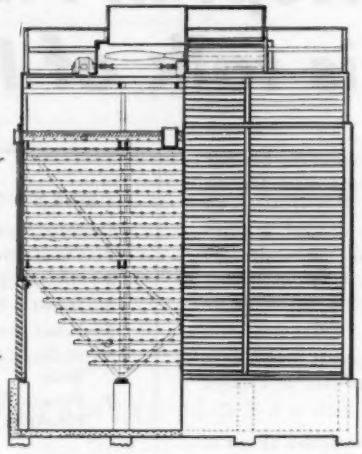
Here's what you get with a *C.H. Wheeler* Cooling Tower

GUARANTEED COOLING RESULTS—Names of installations near you sent on request. Repeat orders prove customer satisfaction. ✓

TWO TENTHS OF 1% DRIFT LOSS—Accurately placed Herringbone Drift Minimizers save on make-up water. ✓

MOST EFFICIENT WATER BREAK-UP—Wood fill arranged for best combination of wetted surface and water drop surface to speed cooling. ✓

NON-COLLAPSING FILL—Rugged 2" x 2" redwood members sawed diagonally—last the life of tower. ✓



GUARANTEED WIND-SAFE—Standard construction for 100 miles per hour—(75 mph is hurricane velocity). ✓

ADVANCED DESIGN PLASTIC FANS—on large towers pioneered by C. H. Wheeler—adjustable pitch blades—20-1 safety factor. ✓

CASINGS CONFORM—to architecture—to fire codes—may be many materials, including redwood, asbestos cement board, masonry, brick, properly painted steel, etc. ✓

NON-CORROSIVE ELEMENTS—Fill is slot-fitted; no nails. Nuts, bolts, etc., furnished in non-corrosive metals. Plastic fan blades. ✓

EASE OF ACCESS—into all parts of tower, *including the cooling space,* for regularity of maintenance. ✓

CUSTOM BUILT—Sure to satisfy your specific requirements. ✓

ENGINEERED FOR THE CLIMATE—50 years of successful experience in building for arid, tropical and cold areas, including severe icing conditions. ✓

INDUCED, FORCED, OR NATURAL DRAFT ✓

LITERATURE MAILED ON REQUEST ✓

C.H. Wheeler OF PHILADELPHIA

VACUUM REFRIGERATION—COOLING TOWERS—HIGH VACUUM PROCESS EQUIPMENT—MICRO-PARTICLE REDUCTION MILLS—STEAM CONDENSERS—STEAM JET EJECTORS—MARINE CONDENSERS & EJECTORS—DECK MACHINERY

C. H. WHEELER MANUFACTURING CO., 1826 SEDGLEY AVE., PHILADELPHIA 32, PA.

REPRESENTATIVES IN MOST PRINCIPAL CITIES

Announcing —

a full line of McDONNELL

One of the worthiest jobs for every heating man is to put every domestic hot water heater and tank on a *SAFE* operating basis . . . and it also happens to be a highly profitable job. The best way to do this at a moderate cost is illustrated and explained here . . . but first consider the background of this development:

As every heating man knows, every hot water storage tank down to the smallest domestic heater is a pressure vessel designed for some predetermined working pressure that should *never* be exceeded. This too-often neglected fact was fully recognized several years ago by an engineering committee of the National Bureau of Casualty & Surety Underwriters who did a large amount of research work on the protection of heaters and tanks.

Their work, later confirmed by an All-industry group, showed that keeping tank pressure within safe limits is fully accomplished when the pressure relief valve has *sufficient capacity to dissipate the maximum heat output of the tank*. This finding is covered by the recommended testing procedure outlined in the A.S.M.E. boiler code. In substance, the A.S.M.E. code recommends that *every* hot water heater shall be equipped with a relief valve having tested, rated, and certified capacity to dissipate the gross heat output of the heater or tank. That's putting it down strong . . . as well it should be.

The McDonnell Safety Relief Valves announced here meet this recommendation to the letter. They are tested and certified as provided in the code and carry on their nameplates the official A.S.M.E. symbol of compliance along with the certified ratings in Btu.'s per hour. The accompanying table covers opening pressures and certified ratings. Note that the final numbers show the opening pressures (3345 opens at 45 lbs., 3375 opens at 75 lbs., and so on). This means that you can equip any tank or heater in your territory with a valve matched to its Btu. output, thus giving the owner protection from overpressure.

Cost is low —Every domestic tank and heater needs this protection, but until this series of valves was developed the added cost of Btu.-rated valves has been a barrier to their universal use. Now that barrier is completely broken down by the development of a valve of such ingenious simplicity that it costs little if any more than valves of unrated capacity and questionable dependability. Note the facts about the design and operation of these valves.

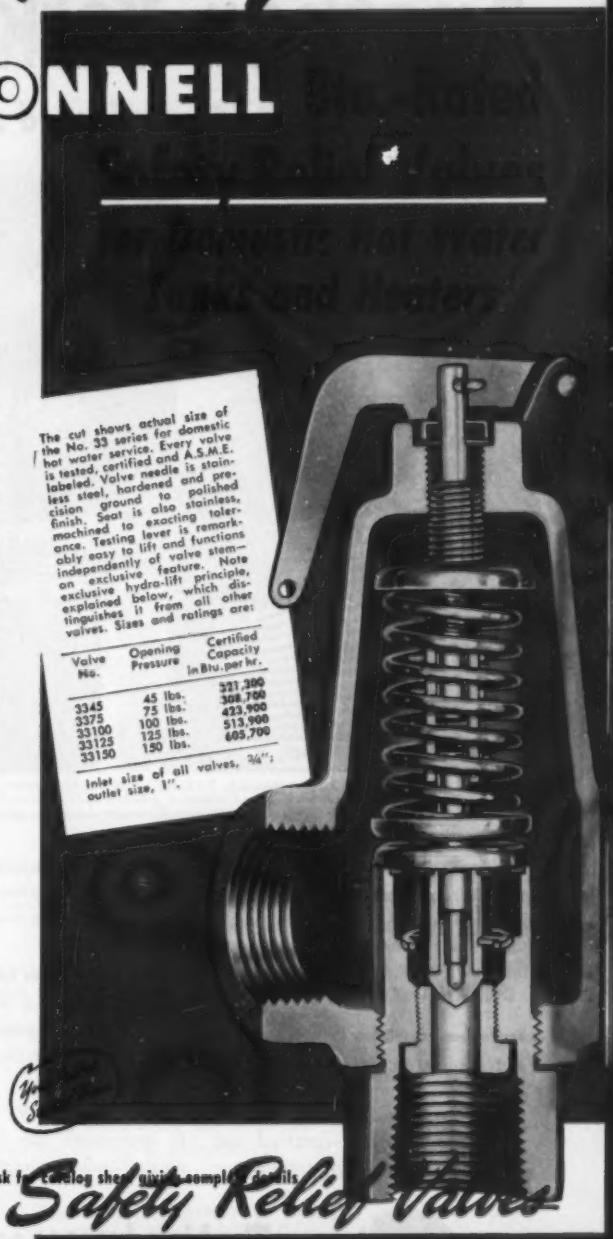
McDONNELL & MILLER, INC.

3500 N. Spaulding Avenue • Chicago 18, Illinois

Doing Our Part for Victory

McDONNELL *Safety Relief Valves*

Ask for catalog sheet giving complete details



The cut shows actual size of the No. 33 series for domestic hot water service. Every valve is tested, certified and A.S.M.E. labeled. Valve needle is stainless steel, hardened and precision ground to polished finish. Seat is also stainless, machined to exacting tolerance. Testing lever is remarkably easy to lift and functions independently of valve stem—an exclusive feature. Note exclusive hydra-lift principle, explained below, which distinguishes it from all other valves. Sizes and ratings are:

Valve No.	Opening Pressure	Certified Capacity in Btu. per hr.
3345	45 lbs.	321,300
3375	75 lbs.	308,700
33100	100 lbs.	423,900
33125	125 lbs.	513,900
33150	150 lbs.	605,700

Inlet size of all valves, ¾"; outlet size, 1".

The nameplate tells the whole story—

Each McDonnell Safety Relief Valve has this plate showing capacity in Btu. per hour as certified by National Board; also A.S.M.E. Code Symbols, size, and opening pressures. You can be sure it is properly matched to the tank or heater.

Another York-Sized Job

World's first fully air conditioned skyscraper apartment houses

Philadelphia's ultra modern cliff dwellings—the 25-story Rittenhouse Claridge and 20-story Rittenhouse Savoy—reach new highs in 100% air conditioned multiple housing.

As so often happens

when York helps out on the tall, tough jobs in air conditioning, the architects and engineers are missing many a headache.

RENDERINGS BY SAMUEL I. OSHIVER

York Fan Window Unit. "Open" view shows Tri-motor Impeller.

Sponsor: Matthew H. McCloskey, Jr. and Kery K. Kaiserman
Architect: Oshiver, Knopf and Fieldstein • Consulting Engineer: Leslie S. Tarleton
Builder: McCloskey & Co. • Mechanical Contractor: Ambrose-Augusterfer Corp.

York's years-ahead techniques

are effecting installation and operating economies . . . and making each tenant a weather czar in his own domain, not the dependent of a fixed and centralized air supply.

York's new Fan Window Unit

above, gives each room its own on-the-spot weather laboratory. Individually equipped to take in fresh air and circulate it—curried and cleaned to mountaintop freshness—at any rate of supply the dweller desires. Filters recirculated air . . . another York plus over centralized-air-system units.

The only central supply system

is water, chilled for cooling and dehumidifying in summer and warmed for winter heating, piped to the Fan Window Units.

With no bulky air ducts

to honeycomb the building—with no air handling equipment to eat up engine room space—the structural, architectural and economic advantages are very obvious.

UNLOAD THE HEADACHES AND DETAIL

of your air conditioning problems. Come to York . . . where the science came of age—where the important advances are pioneered. Protect your clients with the York Certified Maintenance Plan. Check your York consultant—see classified directory. *Or write* York Corporation, York, Pa.

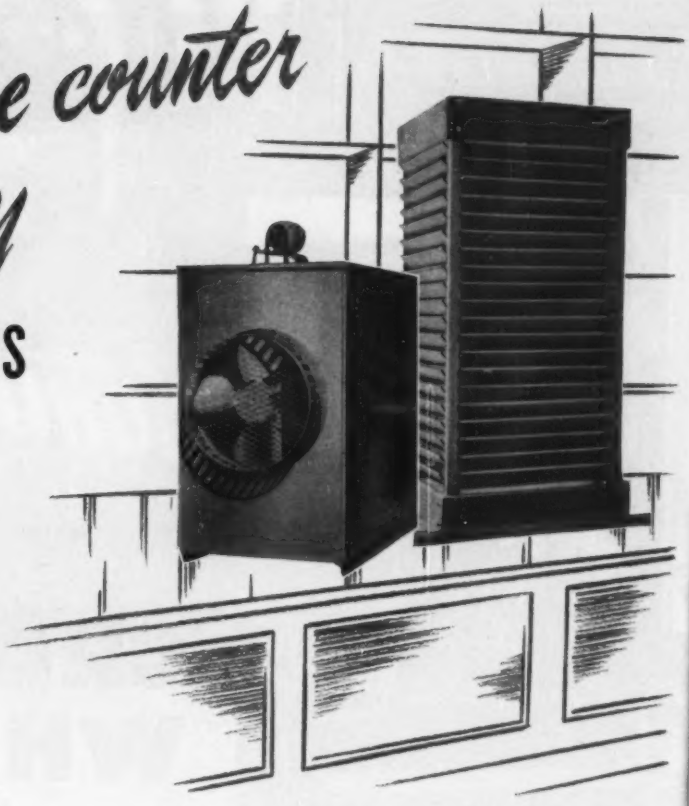
York refrigeration air conditioning

The big advances come from YORK

Headquarters for— **Refrigeration and Air Conditioning**

Over the counter delivery on

AQUATOWERS *and* SERIES 100 NATURAL DRAFT TOWERS



AVAILABILITY is a prime factor for consideration in most equipment today — so it is in water cooling towers for the multitude of three- to fifty-ton jobs this season.

Marley's anticipation of 1951 demand, however, precludes any compromise in quality . . . the finest towers are yours when and where you need them.

AQUATOWERS and SERIES 100 Natural Draft Towers *are ready* . . . in stock awaiting your orders. Service-proved in thousands of installations, these towers are accepted as the standard of the refrigeration and air-conditioning industries. Both types of towers are economical to install and to operate.

There's a size for every job . . . for new construction or for operating improvement of existing installations . . . for location indoors or outdoors.

For complete information contact your nearest Marley representative (one in every large city) or write for Bulletins AQ-50 and 100-51a.

Also Producers of

DRICOOLERS

VAIRFLO TOWERS

DOUBLE-FLOW TOWERS

INDUSTRIAL SPRAY NOZZLES

The Marley Company, Inc.

KANSAS CITY 15, KANSAS

Air conditioning drive ... by CROCKER-WHEELER Protected-Type MOTORS

. . . for Macy's big modernized Kansas City store!

This fine new merchandising unit has set the pace in department store modernization. It is significant that Elliott Crocker-Wheeler protected type wound-rotor induction motors were selected to drive the freon compressors in the all-over air conditioning system. These motors, immune to the ordinary effects of moisture, oil, dust and grit, incorporate many quality features insuring dependable service.

Good buildings everywhere are served by these tough Crocker-Wheeler motors — because engineers and contractors know they are safe in specifying them.

Here's the story on building motors

In this bulletin, the story of Elliott-Crocker-Wheeler squirrel cage and wound rotor induction motors, in NEMA frame sizes, is briefed to a minimum. Send for it. For quick response, address your request to

ELLIOTT COMPANY
Dept. H, Jeannette, Pa.

HALF CENTURY OF 1901 EC 1951 POWER PROGRESS

CW-28

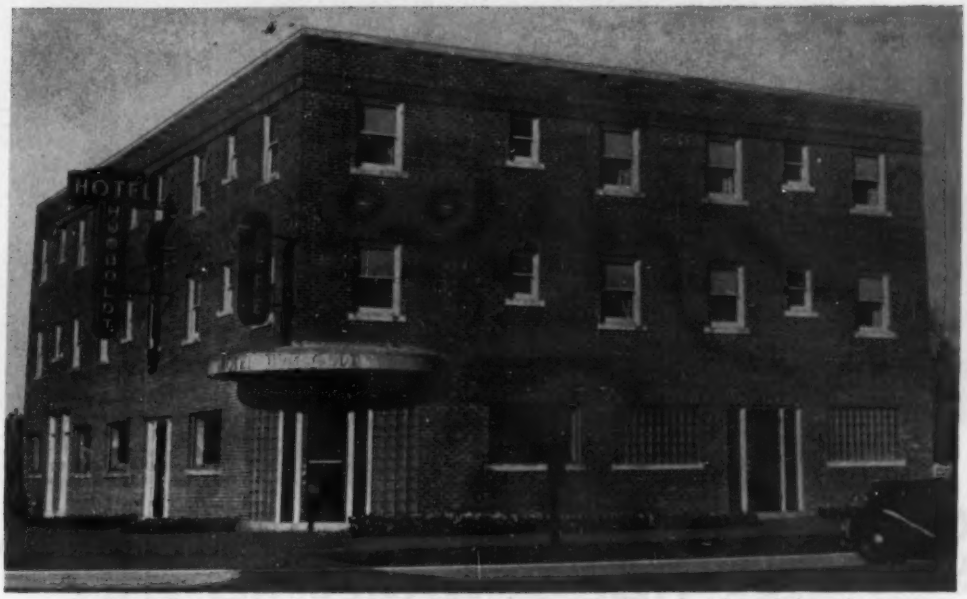
ELLIOTT COMPANY

GENERAL OFFICES & MAIN PLANT—JEANNETTE, PA.

CROCKER-WHEELER DIVISION
Ampere, N. J.

BRANCH OFFICES AND REPRESENTATIVES IN PRINCIPAL CITIES
ELLIOTT *Approved* SERVICE SHOPS COVER THE COUNTRY

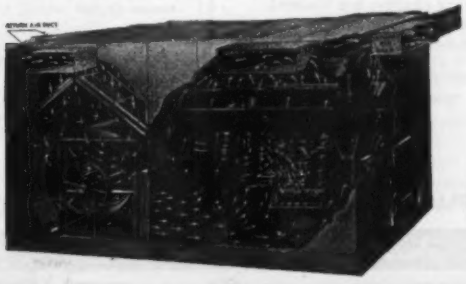
WARM AIR HEATED...
by Campbell



Hotel Humboldt, Humboldt, Iowa. Architect, Frank W. Griffith, Fort Dodge, Iowa. Campbell heated since 1940

Another Outstanding Campbell Installation

Campbell 8000 Series Heaters make it easy to use warm air heat in large multi-room buildings. Campbell gives you all the natural advantages of warm air heat — quick heat delivery — control of temperature, ventilation and humidity — plus easy adaptability for summer air conditioning. High efficiency units assure extremely low fuel costs. Write for full details.

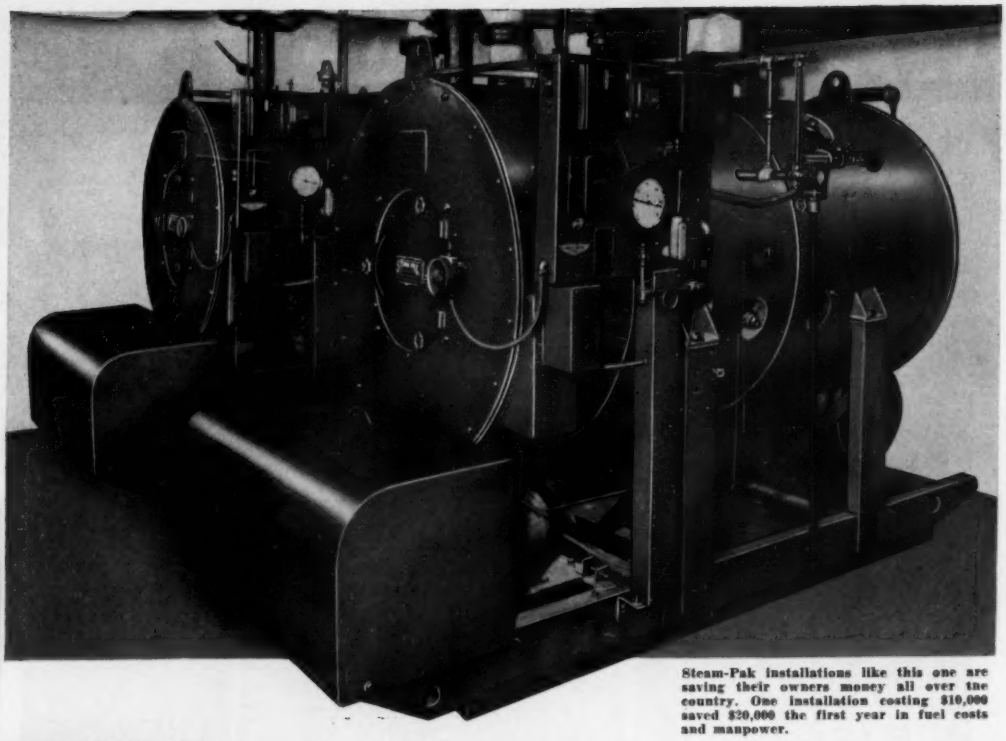


SPECIAL UNITS FOR DRYING & PROCESSING

We build direct oil and gas-fired units up to 14,000,000 BTU's.

CAMPBELL HEATING COMPANY

3143 Dean Avenue • Des Moines 17, Iowa



Steam-Pak installations like this one are saving their owners money all over the country. One installation costing $10,000 saved $20,000 the first year in fuel costs and manpower.

STEAM-PAK YORK POWER GENERATOR
A PRODUCT OF YORK-SHIPLEY

WILL SAVE YOU MORE IN TIME & MONEY BECAUSE...

- Engineering design is recognized by top engineers and architects who specify Steam-Pak for quality and results.
- Satisfactory operation in thousands of buildings and plants all over the country prove Steam-Pak's ability to satisfy customers.
- Distributors chosen for their engineering ability, are trained to provide you with the best engineering "know-how" for installation and service of your equipment.

These are three basic reasons why Steam-Pak should be No. 1 on your list of steam generators. See your nearest York Power distributor, or write for complete details.

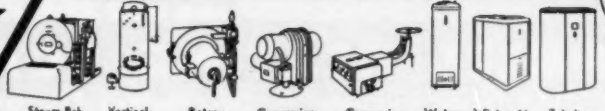
Steam-Pak Generators are built in capacities from 15 H.P. up, for low or high pressure, steam or hot water, for light or heavy oil, combination gas and oil, or straight gas.

YORK SHIPLEY

334 JESSOP PLACE • YORK, PENNSYLVANIA • PHONE 7861

Industrial Division

INDUSTRIAL DIVISION YORK POWER — YORK HEAT RESIDENTIAL DIVISION



Steam-Pak Generators · Vertical Boilers · Rotary Oil Burners · Conversion Oil Burners · Conversion Gas Burners · Water Heaters · Winter Air Conditioners · Tubeless Boiler Units

IN THE REFRIGERATION FIELD,

the surest and safest way to prevent fittings leaks is to install W-S Double-diamond Screw End and Socket Weld Forged Steel Fittings.

Designs are carefully engineered. Basic Materials are selected from a wide choice of carbon, stainless and alloy steels. Drop forging and precision machining makes them light in weight, assures accuracy of finish, and, all are instrument inspected for perfection of threads, sockets, angles and concentricity. Investigate them today.

Write for Bulletin A3-50. For information on stainless and alloy steel fittings ask for Bulletin S-1.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

SPECIFY...

W-S

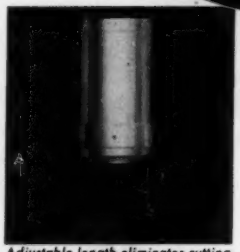
FORGED STEEL FITTINGS

DISTRIBUTORS PRODUCTS DIVISION **WATSON-STILLMAN** ESTABLISHED 1848 • ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Sheers, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

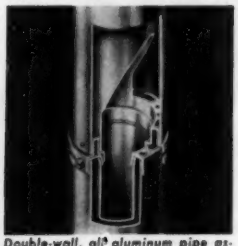
HIGHER PROFITS
SAFER VENTING

WITH UL LISTED QC METALBESTOS GAS VENT



Adjustable length eliminates cutting, speeds erection.

Adjustable elbows simplify installations.



Double-wall, all aluminum pipe assures correct venting.

More Installations per Hour . . . More jobs can be finished per man each day than is possible with any other U.L. listed Type B gas vent. No special tools or skills are needed. Adjustable lengths permit fractional adjustments during and after installation . . . costly jigs, cutting and cementing of joints are eliminated. Single or multiple installations are finished faster and safer when you use QC Metalbestos.

Easy to Handle . . . A carton containing 45 feet of 4-inch Metalbestos weighs only 32 pounds. One man can load, stock-pile or install even the largest diameters without fatigue — can carry 90 feet of pipe at one time with ease.

Safe and Durable . . . Precision manufacture assures automatic alignment, gas-tight joints and a completely safe installation. The pure aluminum inner wall attains efficient venting temperatures rapidly . . . condensation and sweating are held at a minimum. Maximum insulation and the high resistance of Metalbestos to weather and corrosion insure long years of trouble-free operation.

***REMEMBER** . . . Metalbestos Gas Vent meets or exceeds all safety requirements of the Underwriters' Laboratories for Type B gas vents.*

Order from your local jobber or write to Dept. N.

METALBESTOS DIVISION

WILLIAM WALLACE COMPANY · BELMONT, CALIF.

U·S·S GALVANIZED STEEL SHEETS—combined with quality workmanship—make this ductwork a clean, neat, long-lasting job. The heavy coating of zinc offers protection against almost every form of corrosion.

HERE'S ANOTHER VIEW of the same job, taken outside the residence. Inside or outside, U·S·S Galvanized Steel Sheets help assure your customers lasting satisfaction.

for a quality job all the way through U·S·S GALVANIZED STEEL SHEETS

● There's no substitute for a combination of quality materials and quality workmanship. That's why you can turn out your finest jobs with U·S·S Galvanized Steel Sheets.

In the shop, you'll find that U·S·S Galvanized Steel Sheets make fabrication faster . . . material savings greater. These top-quality sheets are easy to handle . . . they can be bent, rolled, cut and stamped with excellent results.

On the job, U·S·S Galvanized Steel Sheets present a clean, neat appearance that is matched only by their long life and superior resistance to corrosion. A heavy, uniform, tightly-adhering coating of zinc gives complete protection against almost every corrosive condition.

You can do a better, longer-lasting job inside and outside with U·S·S Galvanized Steel Sheets.

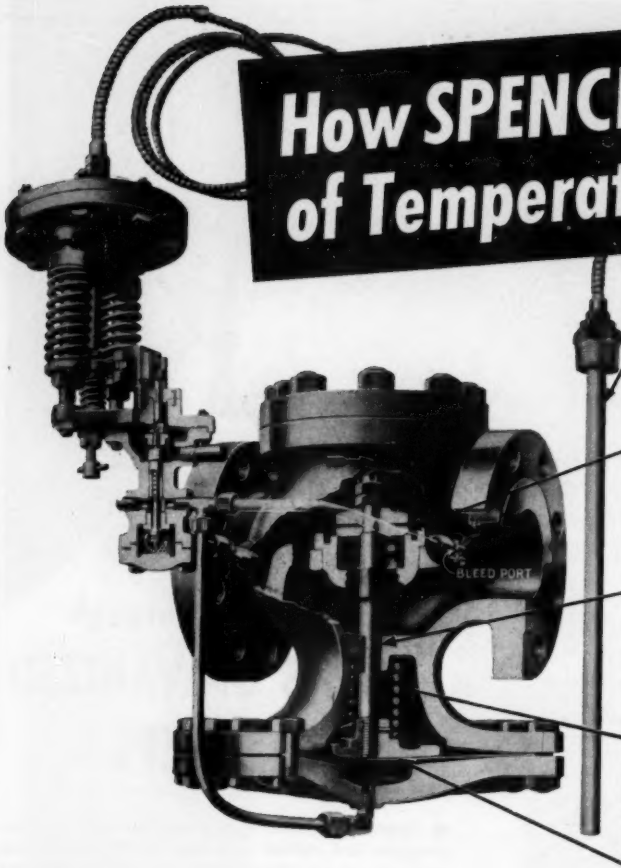
COLUMBIA STEEL COMPANY, SAN FRANCISCO • TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM • UNITED STATES STEEL COMPANY, PITTSBURGH
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **GALVANIZED STEEL SHEETS**

S-875

UNITED STATES STEEL

How SPENCE Cuts Costs of Temperature Control



NEW THERMOSTAT ELEMENT—Improved to practically eliminate loss of filling. Rugged construction; cannot be injured by overheating.

SECO METAL—Seats and discs are made of SECO Metal—guaranteed not to wire-draw.

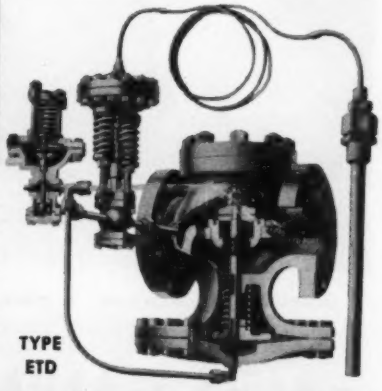
PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

PROTECTED SPRINGS — Springs in the Spence Regulator are out of the path of the steam or other fluid flowing through the valve.

LARGE BALANCED DIAPHRAGM— Spence metal diaphragms, under usual conditions, never require replacement.

Accurate Control for Both Storage and Instantaneous Heaters

Spence Temperature Regulators reduce the steam pressure and also accurately modulate the flow as required to control the temperature. No separate reducing valve is necessary • The Spence ET150 Regulator is recommended for heater pressures up to 50 psi. For higher pressures the Type ETD is available • For complete details on the entire Spence line of automatic regulating valves, strainers and desuperheaters, write for Bulletin 1200.



TYPE ETD

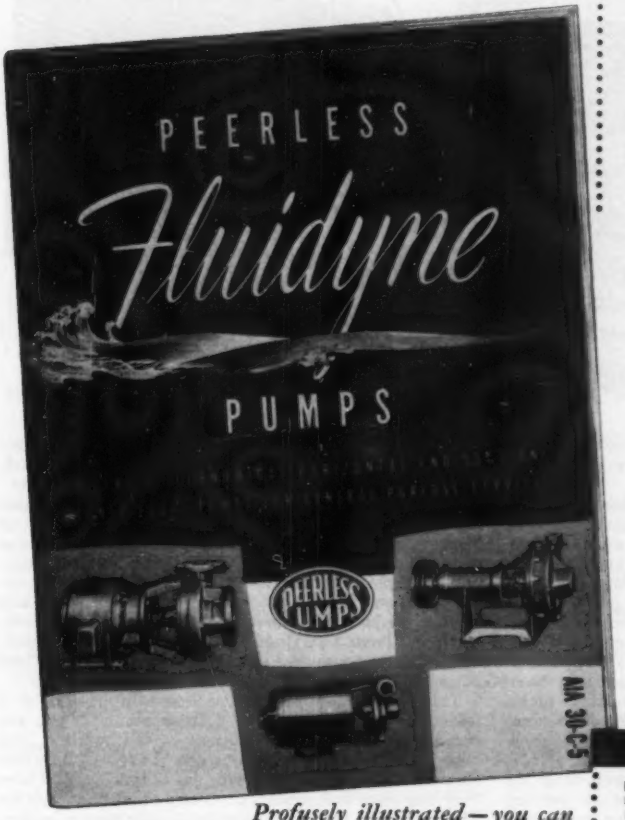
SE 111

Spence

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

NEW BULLETIN AIDS IN SELECTION OF PROPER PUMP FOR YOUR SERVICE

24 pages of informative engineering and application data on horizontal end-suction centrifugal pumps in sizes from 1/4 to 150 hp.



Profusely illustrated—you can apply and buy directly from the Bulletin.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Address Inquiries to Factories at:
Los Angeles 31, California or Indianapolis 8, Indiana.
Offices: New York, Atlanta, Fresno, Los Angeles, Chicago, St. Louis, Phoenix; Dallas, Plainview and Lubbock, Texas; Albuquerque, New Mexico.

PEERLESS PUMPS

EVERYTHING YOU NEED TO KNOW TO CORRECTLY APPLY PEERLESS PUMPS TO MOVING OR TRANSFERRING LIQUIDS

You'll use this bulletin over and over again. From it you can select the proper pump for your liquid transfer service from one of the broadest lines of general purpose pumps offered by any manufacturer. In the complete Fluidyne pump line Peerless provides:

1. **ALL TYPES OF DRIVE,** electric, V- or flat belt pulley and flexible coupled drives.
2. **COMPLETE RANGE OF SIZES,** with motor sizes from ¼ to 150 hp.
3. **BROAD RANGE OF CAPACITIES,** from 5 to 5500 gpm.
4. **WIDE RANGE OF HEADS,** up to 260 feet.

Bulletin is complete with product illustrations and descriptions, pump cross sections, parts lists, dimensional data in both diagram and chart form, easy-to-read pump selection tables and pages of useful pump engineering data.

Write today for your free copy; or if you and your associates can use more than one, request a number of copies. Simply fill in the coupon below or use a penny postcard and request Peerless Pump Bulletin No. B-2300.

MAIL COUPON TODAY

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORP.
Los Angeles 31, California

Please send me a copy of Peerless Fluidyne Pump Bulletin No. B-2300.

NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____

HPAC

DRAVO HEATERS

Saved $530,000*

in mammoth new auto plant

*Compared with conventional steam system cost.

Half a million is important money in anybody's language —and it gets more important when it's SAVED instead of spent.

That's just what happened when a leading automobile manufacturer recently built a mammoth new body stamping plant, with over 600,000 sq. ft. of floor space, and with ceiling heights ranging up to 52-feet. Heat requirements, including fresh air tempering provisions, totalled 54,250,000 Btu. Lowest quoted price for a conventional steam boiler plant was $860,000. ACTUAL cost of a complete Dravo *Counterflo* Heater installation of 53 units was $330,000. These direct-fired warm-air heaters take care of all open-space heating requirements of the manufacturing area of the plant.

Bear in mind that these savings involved no compromise with heating effectiveness. The top-flight engineers responsible for selection knew how vital *comfort* is in keeping employes contented and promoting top output. They looked *first* for the finest in heating results . . . and *second* for economies. They found both profitably combined in Dravo Heaters.

Neither did this saving come from "cutting corners" in building the heater, but rather through the basic simplicity of method and equipment. Each of the oil-fired space heaters manufactures heat "on demand" to blanket its own assigned area with warmth. It also introduces fresh, tempered air into the building as needed. Modulating burner controls permit continuous operation and continuous air circulation. This minimizes temperature fluctuation, assures maximum comfort in all weathers, and conserves fuel—for when any section needs LESS heat, its unit burns LESS fuel. Units all have the Underwriters' Laboratories label. They can be converted from oil to gas, should the fuel situation make this desirable.

This spectacular saving has been duplicated on a lesser scale in thousands of smaller plants. If you are concerned with heating any new or old building, you owe it to yourself to find out how Dravo *Counterflo* Heaters are serving and saving for others . . . and how they can save both system costs and operating costs for YOU. Look in the yellow section of your phone book—or write us direct at Dravo Building, Pittsburgh 22, Pa., for Bulletin FG-523-687.

DRAVO

DRAVO CORPORATION

PITTSBURGH • CLEVELAND • PHILADELPHIA • DETROIT • NEW YORK • CHICAGO • ATLANTA • BOSTON

Sales Representatives in Principal Cities. Mfd. and Sold in Canada by Marine Industries, Ltd., Sorel, Quebec.

Export Associates: Lynch, Wilde & Co., Washington 9, D. C.

perfected engineering

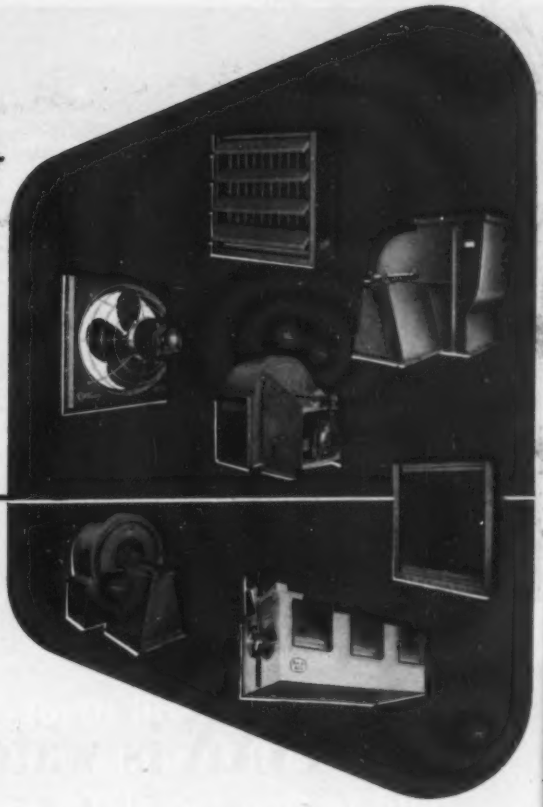
precision manufacture

certified ratings

nyb

responsible guarantees

of dependable performance



Wherever air is handled mechanically, whether for ventilation, heating or process, the name New York Blower enjoys an enviable reputation. ***nyb*** on a product means that the engineering knowledge acquired through sixty-one years of manufacturing experience and development is built into it.

Are you using AIR to the best advantage in your production methods to cut costs, increase efficiency, reduce absenteeism, safeguard health, bring comfort to workers...or applying it to process control for precision manufacture and more uniform products?

When working on your air handling problems, consult the ***nyb*** representative nearest you in our nationwide service.

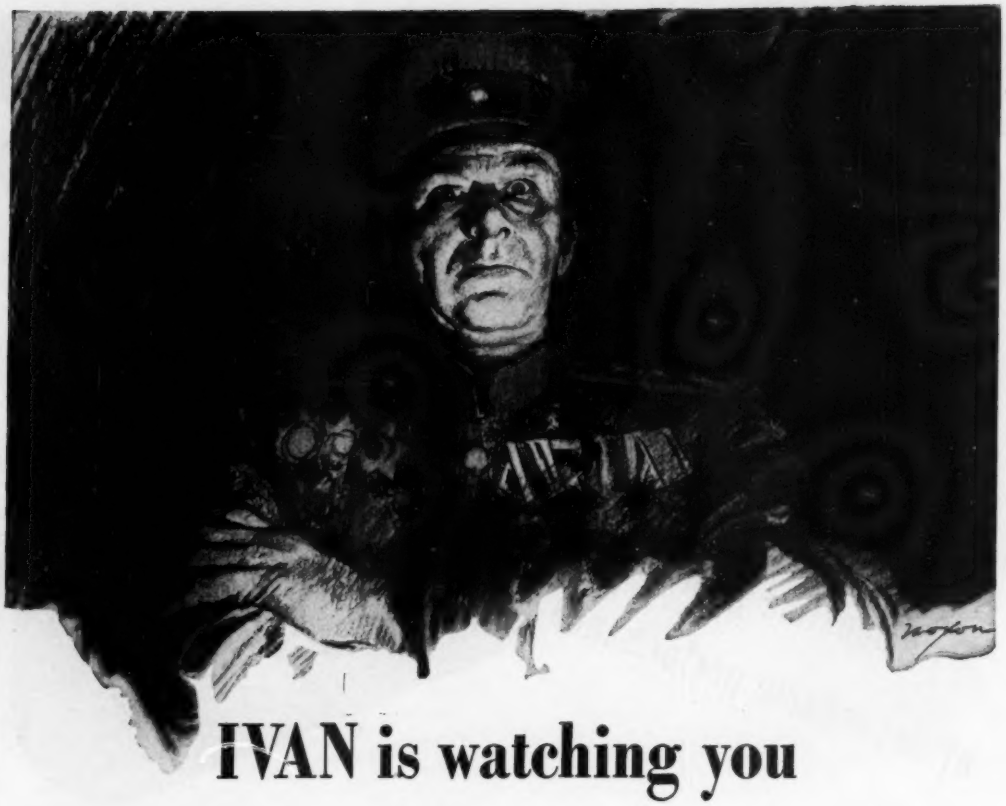
write for bulletins

nyb

THE NEW YORK BLOWER COMPANY

GENERAL OFFICES • 32nd STREET & SHIELDS AVENUE • CHICAGO - 16

FACTORIES AT LAPORTE, INDIANA AND CHICAGO, ILLINOIS



IVAN is watching you

IVAN is a dyed-in-the-wool Communist. There are only 6 million party members like him in all Russia, yet these Communist brass-hats enforce the iron dictatorship of the Kremlin over *200 million* Russians.

He's sold to the hilt on Red ideas. Which means he's out to get *you*. He believes it's either you or him . . . that the world is too small for both.

Ivan is working hard to beat you down. He has a big head start.

Right now he's got you in a bad spot.

Ivan is afraid of only one thing.

He fears your ability to out-produce him in guns, tanks, planes.

Frankly, he doesn't think you value your free system enough to do it . . . to make willingly the sacrifices he has squeezed out of the Russians.

But he's wrong!

Because you and all of us have set out to build more and better weapons—to do it faster all the time.

We must use every bit of know-how and inventive skill we have to improve our machines and methods—to turn out more and more for every hour we work. Only in this way can we become militarily strong.

But we've got to supply essential civilian needs as well. We can't allow needless shortages to take prices skyrocketing and lower the value of our dollar.

Sure, that means sacrifices for everybody. But doing this double job well is the only sure way to stop Ivan in his tracks—and to save the freedoms which are ours and which he has never known.

FREE . . . this important booklet tells you how our American System Grew Great

How Americans developed better machines, power and skills to build a great nation . . . Why we have been able to produce constantly more per hour . . . How this has given us the world's highest living standard.

How we can meet today's challenge—Why we must expand our productive capacity . . . supply arms and essential civilian needs, too. Read how this dynamic process works in free booklet, "The Miracle of America," endorsed by representatives of management and labor. Send for your free copy today!

MAIL THE COUPON—
The Advertising Council, Inc., 25 West 45th St., Dept. B. P. New York 19, N. Y.

Name_____

Address_____

Occupation_____

This advertisement, approved by representatives of management, labor and the public, is published in the national interest

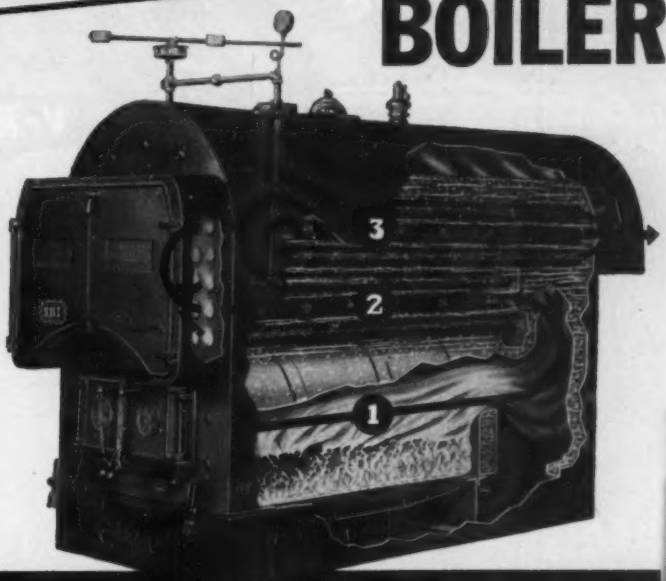
THE BETTER WE PRODUCE
THE STRONGER WE GROW

Heating, Piping and Air Conditioning

This is the Compact Type **STEEL BOILER**

with the famous

BURNHAM FIRE TRAVEL*



***3 times-back-and-forth fire travel means heat transfer is more efficient — you get more BTUs per unit of fuel!**

THE BURNHAM "COMPACT TYPE" Welded Steel Boiler with this famous feature is notable for low flue temperatures, high boiler efficiency and low fuel costs. Capacities for SBI Steam Hand-fired range from 3,000 to 35,000 sq. ft. and SBI Steam Automatic from 3,650 to 42,500 sq. ft.; SBI Hot Water Hand-fired range from 4,800 to 56,000 sq. ft. and SBI Hot Water Automatic from 5,840 to 68,000 sq. ft.

Long experience and intensive research have produced in this efficient BURNHAM Steel Boiler the last word in quality and dependability.

Some of its outstanding features are: Large steam dome permitting quick, easy steaming without priming. Rapid, continuous water circulation for efficient heat transfer. All sediment settles away from hot surfaces. Low water line for easy installation and piping. Plenty of clean-out plugs.

For schools, apartments, greenhouses and similar installations the BURNHAM "COMPACT" Steel Boiler provides dependable low cost heat. Send for 8 page catalog with full details and ratings.

Copper coils, storage or tankless type, can be installed in all sizes for an abundant supply of domestic hot water.

Burnham Corporation

"PIONEERS OF RADIANT BASEBOARD HEATING"

STEEL BOILER INSTITUTE · SBI · HEATING—PROCESS—POWER

IRVINGTON, N. Y., Dept. HP-31

Burnham RADIANT HEATING SINCE 1870

BURNHAM CORPORATION
Irvington, New York Dept. HP-31

Please send copy of catalog SB-104 giving details and ratings on Burnham Steel Boilers.

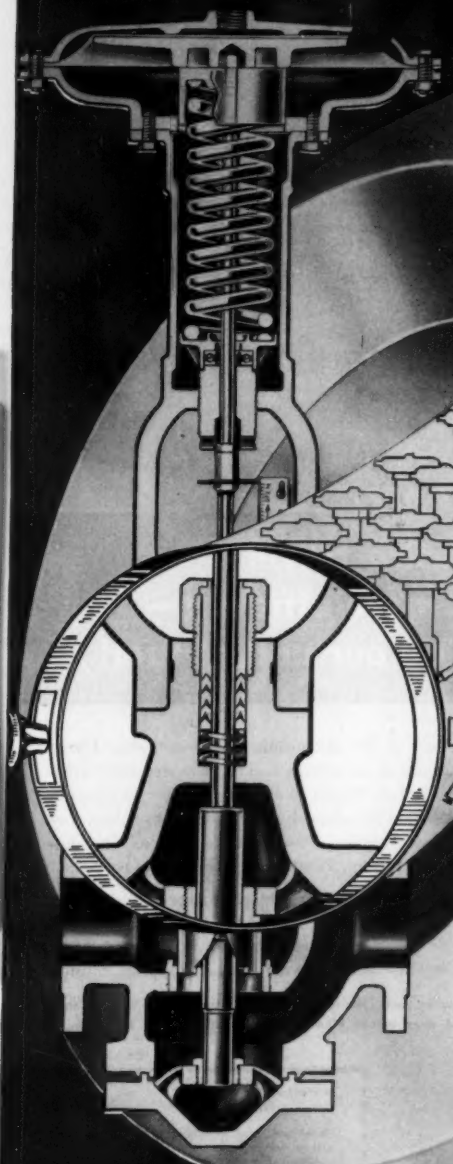
Name_____

Address_____

City_____ State_____

FISHER®

V-RING PACKING



. . . LEADING THE MARCH TO BETTER DIAPHRAGM MOTOR VALVE PERFORMANCE

roved by many months of field service Fisher Teflon V-Ring Packing feature

- No gland leakage.
- Used on wide range of pressures w out appreciable change in friction va
- Elimination of maintenance an adjustment.
- No valve stem lubricators re
- Chemically inert to all fluid 450° F.

Fisher Teflon V-Ring Packing is now all Fisher Diaphragm Motor Valves

Bulletin E-200 give

*Teflon is the trade name

FISHER GOVERNOR COMPANY

Here's a *Space-Saving* air distribution system

using
kno·draft
type HPC high pressure
air diffusers

Kaufmann's Department Store, Pittsburgh, Pa., uses 3,500 Kno-Draft HPC Air Diffusers. Units are installed 7 feet apart on 7″ x 14″ ducts, which are located 20 feet apart and mounted about 9 feet from the floor. In spite of the small, space-saving ductwork, thorough, draftless distribution of air is obtained.

Kno-Draft Type HPC High Pressure Air Diffusers are brand-new in principle, but already *proved* in service. Operating at high pressure and velocity, they provide draftless distribution of air to large open areas but require only small, uniform, exposed ducts. As developed for Kaufmann's Department Store in Pittsburgh, the Kno-Draft Type HPC High Pressure Air Diffuser—

1. **Saves** space; uses small, uniform exposed ducts.
2. **Operates** at high pressure and velocity —allows 3000 fpm velocities and 2″ static pressure in ducts.
3. **Achieves** high air induction, draftless distribution—primary air 25° colder than room air.
4. **Provides** complete adjustability to any volume between 90 and 180 cfm, or may be totally shut off.
5. **Functions** perfectly in department store and general office applications.

A new type perforated damper, combined with an interior baffle and jet exit, permits the high pressures and velocities necessary. For a detailed description of the new Kno-Draft Type HPC Air Diffuser—how it works and its application possibilities—mail the coupon today.

TRADE MARK "KNO-DRAFT" REG. U. S. PAT. OFF.

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. G-31, Danbury, Connecticut

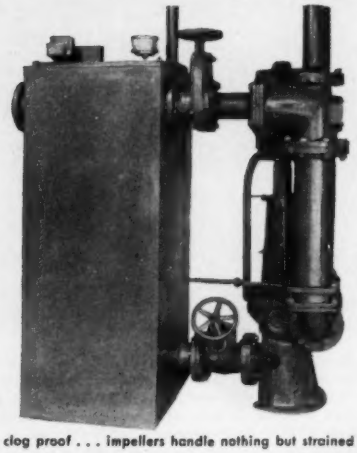
Please send me, without obligation, Bulletin K-26, which provides full information on the NEW TYPE HPC Kno-Draft Air Diffuser.

Name .....
Position .....
Company .....
Street .....
City ..... Zone ..... State .....

For Every Service Within the Building

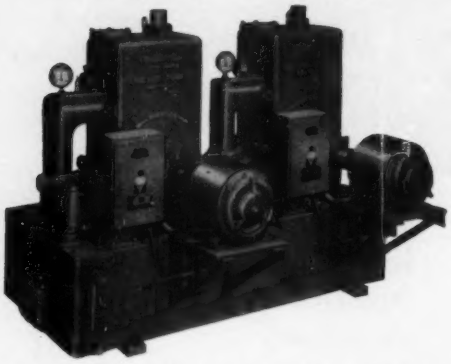
Specify Chicago PUMPS

FLUSH-KLEEN Sewage Ejector



Absolutely clog proof . . . impellers handle nothing but strained sewage, minimizing wear and maintaining pump balance. Specially designed for plumbing systems in buildings where maximum flow is not more than 50 GPM. A second unit can be added any time to make duplex installation.

CONDO-VAC Return Line Vacuum and Boiler Feed Pump



No vacuum on stuffing boxes, ample clearance in rotating member. It costs less to operate a "Condo-Vac." "Condo-Vac" reduces corrosion in piping and boiler to minimum—because pump does not take in air from atmosphere and entirely eliminates all air coming back from system. "Condo-Vac" is quiet, has a low inlet, entirely automatic, easy to maintain.

CHICAGO CIRCULATING PUMPS

Type "D"—For "Heavy Duty" Building Application.

The complete line of "Chicago" Pumps are built to give you exactly the type of service you want . . . efficiency . . . convenience . . . minimum operating and repair expense. Construction leaders everywhere endorse these "Chicago" pumps.

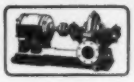
Type "N"—For "Light Duty" Building Application.

Write for data on our complete line of equipment.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**



Condo-Vac, Sure Return. AVC, LVC, Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.

FIRST for forced warm-air heating

Here's one of the stars of the heating industry! Feature for feature, this Bryant Gas-Fired Forced Warm-Air Furnace offers advantages of design, construction and performance that are unsurpassed in any other warm-air unit.

Take its rugged *Hevigage* 12-gauge steel heat exchanger . . . almost three times as thick as the minimum required by A.G.A. and designed to provide the most rapid and efficient heat transfer. Take the brilliantly engineered Bryant Automatic Pilot and Controls, with their long record for reliability and gas-thrifty operation.

Run down the complete list of Bryant features in this popular unit and you'll decide it's the one you can count on for quick, easy, trouble-free and *profitable* installation!

The Bryant Distributor near you will welcome an opportunity to tell you the whole story. Contact him today, or write direct to Bryant Heater Division, Dept. 152, Affiliated Gas Equipment, Inc., 17825 St. Clair Avenue, Cleveland 10, Ohio.

Bryant Model BA-87 Gas-Fired Forced Warm-Air Furnace. For all gases. A.G.A. inputs from 60,000 to 375,000 Btu per hour.

Let the pup be furnace man ...and water boy too!

bryant

AUTOMATIC HEATING

Your *single* source of supply for everything in gas heating equipment!

Taco Times

Published in the interest of greater sales for the industry

VOLUME 1 NUMBER 1

PROFIT FORECAST
Use Taco Circulators
and
Spe

TACO TIMES

GO AFTER MODER

Taco-Vent, automatic hot water air valve, now vents 3 times faster

Contractors went after Taco-Vent with both hands when they were first introduced. Most contractors use Taco-Vents on every one of their jobs. While homeowners have usually been anxious to have them and pay for them, smart contractors put them on every job . . . . . even if they have to pay for them themselves. These contractors figure that the Taco-Vents cost a lot less than the labor of going back to bleed jobs. AND NOW THE NEW MODEL TACO-VENT VENTS THREE TIMES FASTER THAN THE OLD MODEL. You can tell the new model by the fact that the holes are in the hex part of the Taco-Vent.

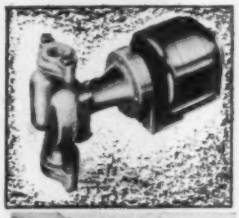
Reverse Action Control Eliminated

Taco-Matic does a better job for less. Does three other jobs at the same time.

Tankless heaters now work fine on forced hot water jobs because Taco-Matic valve provides a positive shut off whenever boiler water temperature drops to 175 F. The catch with reverse action controls is that they're never quick enough to keep the circulator from emptying the hot water into the system when the thermostat calls for heat.

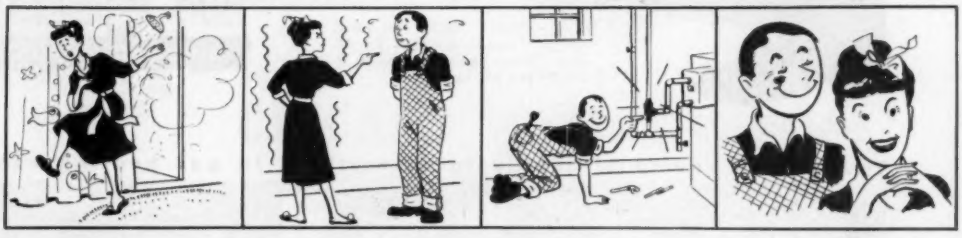
In addition to doing a perfect job of protecting the tankless heater, Taco-Matic reduces copper pipe noises and improves large pipe conversion jobs by providing longer circulator operation. 1" and 1¼" now double tapped for dip tube at no extra cost.

TACO'S HORIZONTAL CIRCULATOR IS A CINCH TO SERVICE



To change seals on the job, all you need is an open end wrench, screwdriver and allen set screw wrench. Taco's carbon seal runs against a stainless steel seal eliminating any wear in bracket.

"TACO TEMPERING VALVE SURE MAKES THE LADIES HAPPY"

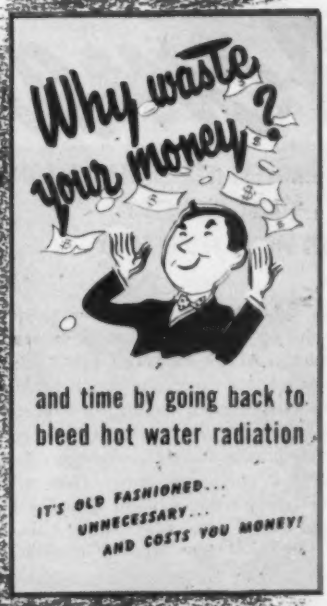


TACO TIMES

NIZATION WORK

Taco backs up contractors in 1951 by supplying free business builders to aggressive contractors

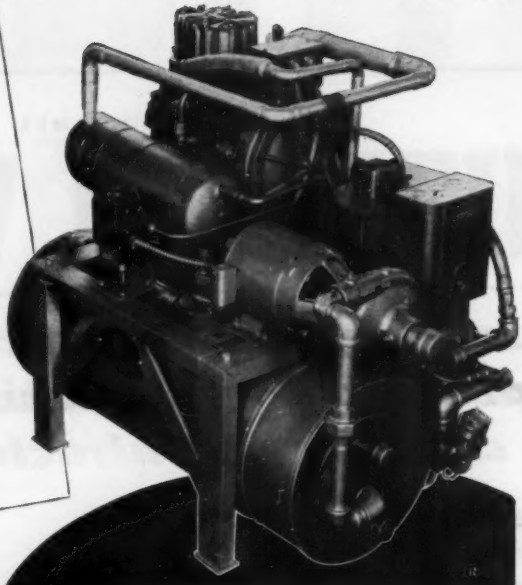
With credit restrictions in effect, smart contractors will be going after more repair and modernization work. There's enough of that profitable business to keep all men on the present payroll busy. But it'll be harder to dig out business in 1951. These business builders of Taco's are designed to make homeowners want to spend money to fix up their present heating systems. Use them to remind homeowners to spend their dollars with you. They're free for the asking.


Why waste your money?
and time by going back to bleed hot water radiation
IT'S OLD FASHIONED...
UNNECESSARY...
AND COSTS YOU MONEY!

Better Heating-Better with Taco

TACO HEATERS, Incorporated—137 South Street—PROVIDENCE 3, R. I.

OPENS UP NEW MARKETS



Acme FLOW-COLD LIQUID CHILLERS

LOW COST PROCESS TEMPERATURE CONTROL FOR INDUSTRY WITH ACME FLOW-COLD*

For EVERY industrial application where production can be speeded up or improved through process temperature control, ACME FLOW-COLD* Units offer a practical, efficient low cost solution. Easily adapted for cooling water, coolant cooling, solution cooling, production welding, mold cooling, laboratory cooling or any Industrial Process Temperature Control. Equally suited to Air Conditioning. Here at last, is a fool proof, simple and efficient Unit for HEAT PUMP application. Matching Acme Convectors, Coils and Cooling Towers are also available.

ACME FLOW-COLD UNITS:

- Cut costs and increase production.
- Are safe and compact.
- Versatile, easily controlled.
- Factory assembled and tested.
- Complete, ready to connect.

Contact your nearest distributor or write direct for complete information and specifications. We are looking for a few outstanding Dealers and Jobbers to complement our fine distributing organization.

ACME ALSO MANUFACTURES: Dri-Ex* Water Coolers — Hi-Peak* Water Coolers — Evaporative Condensers — Shell and Coil Condensers — Shell and Tube Condensers — Fin Coils — Cooling Towers — Oil Separators — Liquid Receivers — Heat Exchangers.

*Trade Mark

"Continuously serving the Air Conditioning and Refrigeration Industry SINCE 1919."

ACME PRODUCTS

ACME INDUSTRIES, INC.

JACKSON, MICHIGAN

Zallea Expansion Joint News

PUBLISHED BY ZALLEA BROTHERS—WORLD'S LARGEST MANUFACTURERS OF EXPANSION JOINTS EXCLUSIVELY

Expansion Joint of the Month

HINGED TYPE JOINTS

Zallea Stainless Steel Hinged or Rotation Type Expansion Joints have successfully served industry and government for over a decade. Normally designed to absorb expansion in one plane by rotation, we now offer hinged expansion joints of the universal type for rotation in all planes and a combination of rotation and axial movement in a single unit. Designed for piping systems which, because of their size and location, cannot be supported or anchored in the conventional manner, a minimum of 2 hinged joints is required for a single installation. Self-supporting at all times, each expansion joint bends angularly giving the same effect as a hinge at each elbow. This action reduces bending stresses in the piping and eliminates cumbersome anchors and supports. Being a special purpose product, they must be specifically designed for each individual application. Your inquiry should include a drawing of the piping installation, stating maximum pressures and temperatures and any special conditions that may exist. Without this information, proper design and installation cannot be achieved.

The supply is going fast...send TODAY for your copy of Catalog 47, a text book and valuable reference source on all Zallea Expansion Joints.

ZALLEA BROTHERS, 816 Locust Street, Wilmington 99, Delaware

GULF OIL USES ZALLEA

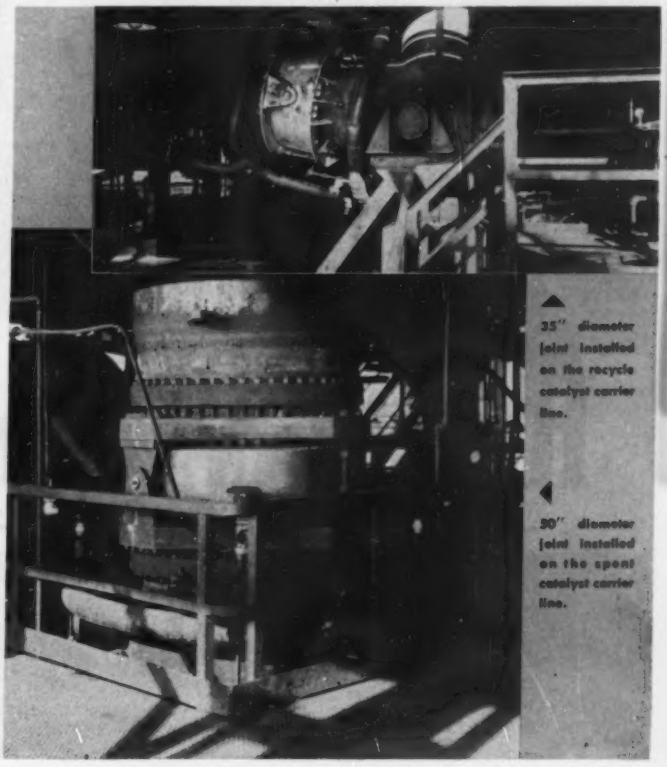
TWO HINGED JOINTS USED ON "CAT" CRACKER

Pictured here are two Zallea Stainless Steel Hinged Expansion Joints, installed on a "cat" cracker at Gulf Oil's Philadelphia refinery. The 35" diameter joint is used on the recycle catalyst carrier line and the 50" diameter joint is installed on the spent catalyst carrier line. Installation of these Zallea Hinged Expansion Joints was made without difficulty during a routine shut-down early in 1950. Since that time operation has been reported to have been maintenance-free.

Built For Long Service

In similar jobs in other refineries... whenever there is a need for simplified piping... Zallea Stainless Steel Hinged Joints are used... often as replacements for competitive expansion joints in existing lines. Each Zallea Stainless Steel Hinged Expansion Joint is designed for a specific job—designed after a thorough study of the piping problems involved. On special order, they are available in sizes up to 30 feet in diameter, as well as for temperatures up to 1600° F.

When the job calls for expansion joints of any type and size—insist on Zallea—you'll find it pays!


35" diameter joint installed on the recycle catalyst carrier line.
50" diameter joint installed on the spent catalyst carrier line.

CUT FUEL COSTS
this Quick Easy Way!
CHECK THESE SPOTS
✓STEAM RADIATORS
✓UNIT HEATERS—
✓PIPE COILS ✓DOWN-FEED RISERS ✓CONDENSING RADIATORS
✓BLAST COILS
✓ENDS OF STEAM MAINS, ETC.
Sediment accumulations, worn seats and pins, "dead" thermostats—any one of these may be causing a serious loss of steam. The only way to guard against this waste is to open up your traps—once a year at least—and eliminate the troublemakers. Remember that the tiniest steam leak, during a year's operation, can waste an unbelievably large amount of fuel.
HOFFMAN Steam TRAPS
HOFFMAN SPECIALTY COMPANY, Dept. FG-3, 1001 York St., Indianapolis 7, Ind.
Famous for HOFFMAN VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS Sold by leading Wholesalers of Heating and Plumbing Equipment

ARE YOU WORKING ON ANY PROBLEMS INVOLVING THE INSULATION OF PIPES? LET THIS HELPFUL FACT FINDER GIVE YOU...

...Btu Loss
...Surface Temperature
...Efficiency of

FIND THE FACTS ABOUT

2 GREAT PIPE INSULATIONS

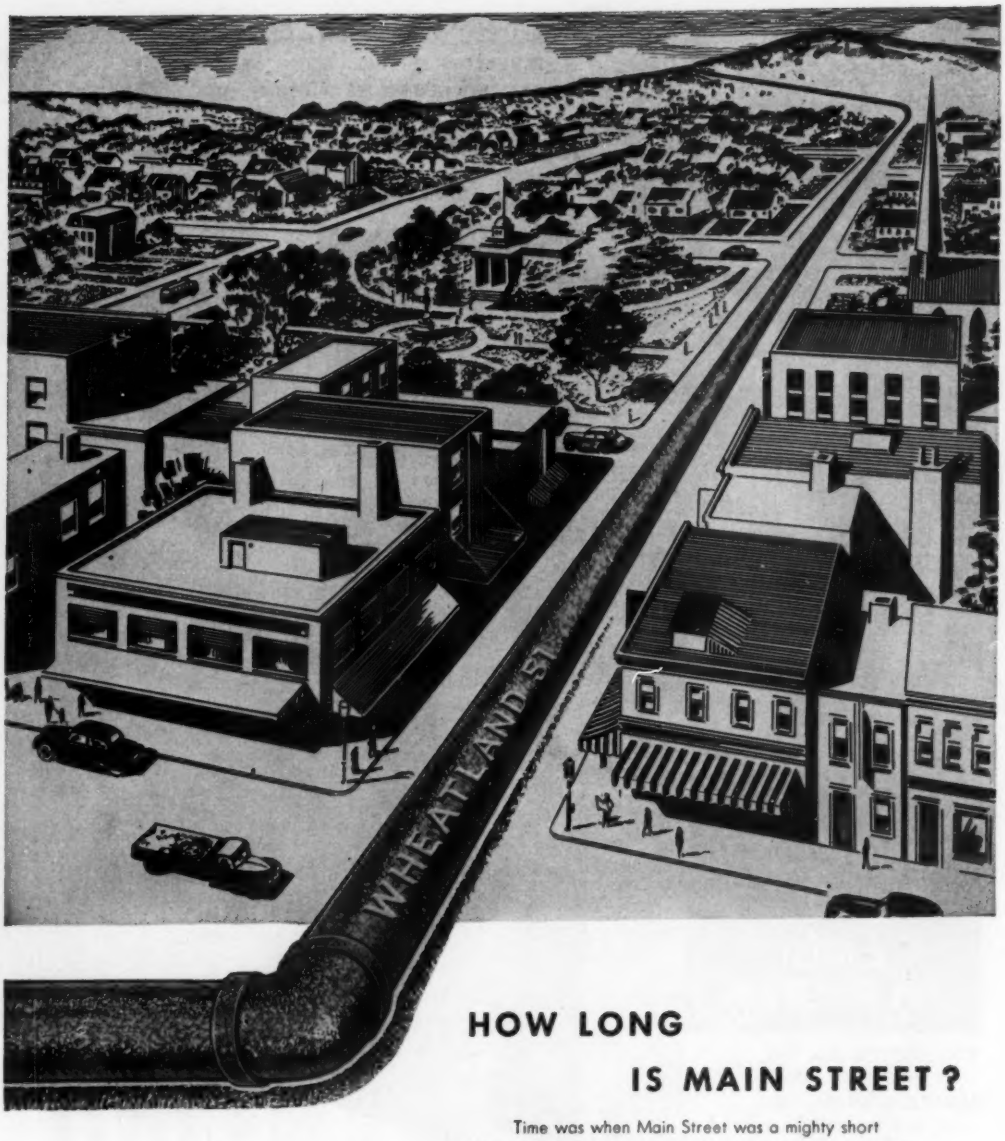
UNIBESTOS No. 750
—for temperatures up to 750° F.
UNIBESTOS No. 1200
—for temperatures up to 1200° F.

UNARCO

WRITE today, on your company letterhead, giving your title or function. A "Fact Finder" will be sent to you together with complete information on UNIBESTOS Pipe Insulations No. 750 and No. 1200.

UNION ASBESTOS & RUBBER COMPANY

DEPT. 1819A • 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS



HOW LONG IS MAIN STREET?

Time was when Main Street was a mighty short thoroughfare. Today, however, thanks largely to modern developments in transportation, communications, and the transmission of oil, air, gas, water, and steam, the borders of Main Street have been extended to cover the entire U.S.A. We at Wheatland are proud of the role played by "the pipe with the yearmark" in the great arterial system through which flows the life-blood of power, energy, and materials of the nation.

-pipe with the yearmark!

WHEATLAND TUBE COMPANY

Bankers Securities Building, Juniper and Walnut Sts., Phila. 7, Pa.

THE *VALUE* IN VULCAN

1 Vulcan fins imbedded in the heating tube by a special Vulcan process make a nearly integral heating unit promoting *best heat transfer* characteristics.

2 Vulcan fins are offset. This standard Vulcan feature gives a rigidity to the fins and insures a permanent bond between the primary and secondary surface.

3 Vulcan *steel* radiation is fabricated from seamless steel pressure tube, A.S.T.M. Spec. A-83. Units have IPS threads checked to government standard. Vulcan *copper* radiation is made from heavy type K water tube with either copper or aluminum fins. Ends are chamfered for sweat fittings, a feature that appreciably reduces installation costs.

Vulcan Standard fin-tube radiation for schools, hospitals, industrial and public buildings is available in five sizes in steel or copper. Also, Vulcan Radi-Vector in sizes for homes and residential units.

Send for illustrated catalogs.

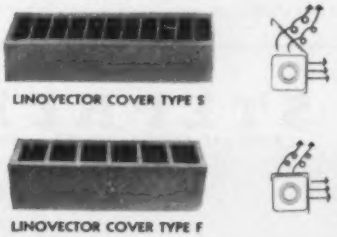
Made in Canada under the trade name of Heal Radiation by the Vapor Car Heating Company of Montreal.

VULCAN RADIATOR COMPANY
26 FRANCIS AVE., HARTFORD, CONNECTICUT

No lost BTU's caused by loose fins

. . . Says "Buddy" Vulcan, a real B. T. U.

RADIANT PLUS CONVECTION HEAT
for smooth heating comfort



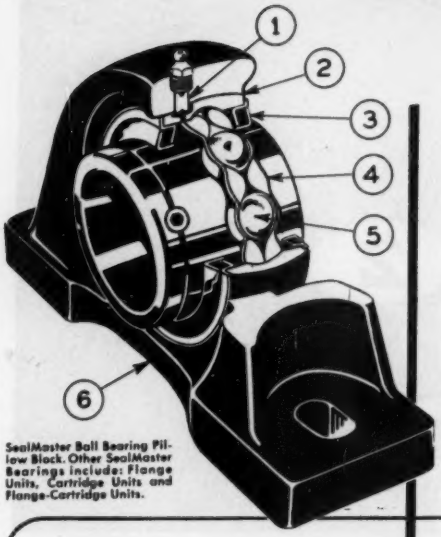
LINOVECTOR COVER TYPE S

LINOVECTOR COVER TYPE F

OVER A QUARTER CENTURY OF FIN-TUBE RADIATION

Design *Your* fans, blowers, and air-conditioning equipment to include SEALMASTER

BALL BEARING UNITS



SealMaster Ball Bearing Pillow Block. Other SealMaster Bearings include: Flange Units, Cartridge Units and Flange-Cartridge Units.

1. NO HOUSING WEAR!
Patented locking pin and dimple prevent rotation of outer race in housing, thus eliminating housing wear . . . permit shaft alignment and position unit for relubrication.

2. SELF-ALIGNING!
Bearing unit, with seals independent of housing, can align itself in any direction without seal distortion.

3. PERMANENTLY SEALED!
Felt-lined steel flinger rotating in labyrinth prevents entry of dirt and retains proper amount of lubricant.

4. FLOATING RETAINER!
Ball retainer is designed to float on ground inner surface of outer race . . . traps lubricant and prevents churning.

5. PRE-LUBRICATED!
The bearing chamber is filled with the proper amount of grease before bearing leaves factory.

6. HOUSING DESIGN!
SealMaster's cast housings combine rigid one-piece construction with neat streamlined appearance.

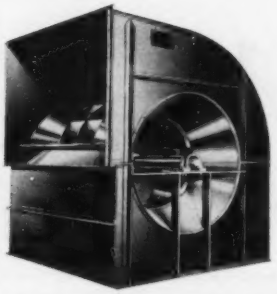
SILENCE Your Air-Conditioning Equipment with These SEALMASTER UNITS

4-BOLT BASE PILLOW BLOCK

FLANGE UNIT

STANDARD DUTY PILLOW BLOCK

A complete line of SealMaster pillow blocks, flange units and other types are available in a wide range of shaft sizes and ,for varying degrees of service. SealMaster units are designed and constructed to give top performance on all types of fans, blowers, pumps and other equipment in the air conditioning field. Include SealMaster bearings in your design and improve your product. Write us for a free copy of SealMaster catalog No. 845.

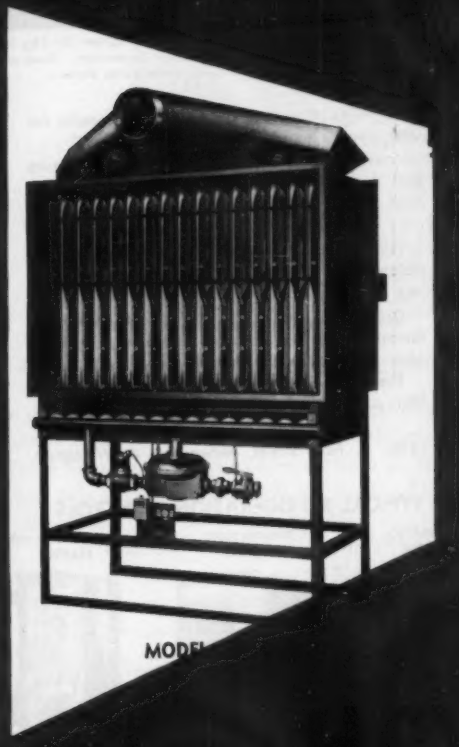

Climate changer unit for commercial and residential air conditioning uses SealMaster bearings for noise-free, dependable operation. Trane Company photograph.

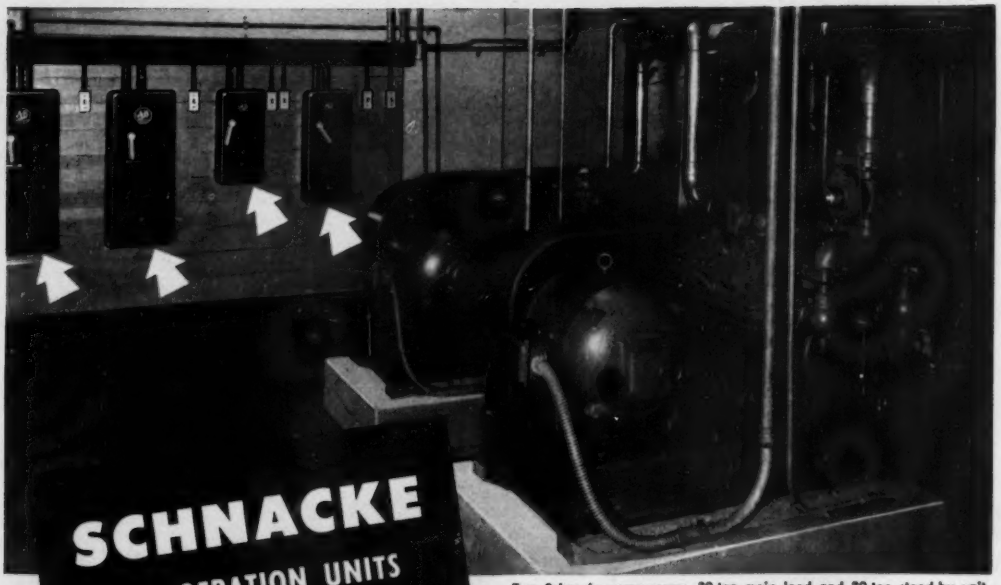
BEARING DIVISION

STEPHEN S-A DAMSON MFG. CO.

47 RIDGEWAY AVENUE, AURORA, ILLINOIS · LOS ANGELES, CALIF. ★ BELLEVILLE, ONT.

Factory Representatives and Dealers in All Principal Cities


MODEL



SCHNACKE

REFRIGERATION UNITS

equipped with

ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

Two Schnacke compressors, 30-ton main load and 20-ton stand-by unit, installed in the building of Interstate Finance Corporation. These compressors are equipped with Allen-Bradley combination starters.

Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley patented silver alloy contacts never need cleaning, filing, or dressing.

Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations.

Allen-Bradley Co.
1335 S. First Street, Milwaukee 4, Wisconsin.

A-B Quality

TYPICAL REFRIGERATION CONTROLS

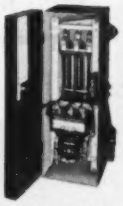
AUTOMATIC STARTER

Allen-Bradley Bulletin 709 solenoid starter.

COMBINATION STARTER

A-B Bulletin 712 disconnect switch type combination starter.

VELVET SMOOTH STARTER



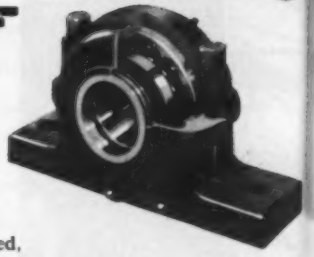
A-B Bulletin 640 manual resistance type starter.

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

CUSTOMERS KEEP COOLER AT KAUFMANN'S

with mammoth air-conditioning fans

pillow blocks engineered by **SKF**



One of the country's finest department stores, Kaufmann's in Pittsburgh recently installed two mammoth air-conditioning fans. Built by Buffalo Forge Company, these two fans are each as big as a two-story house and deliver approximately 500,000 cu. ft. of air per minute. Only one blower and one exhaust fan serve the entire system which conditions the air from the second story through to the thirteenth. These giant fans are equipped with SKF Pillow Blocks. Self-aligning, long-lived, requiring infrequent lubrication and inspection, SKF is specified for most major tunnel fan installations, as well as for many interior air-conditioning systems.* 7176

*For detailed information on ventilating and air-conditioning fans built by Buffalo Forge Company, write P. O. Box 985, Buffalo 5, N. Y.

8 REASONS WHY SKF IS PREFERRED BY ALL INDUSTRY

integrity
craftsmanship
metallurgy
tolerance control
surface finish
product uniformity
engineering service
field service

SKF

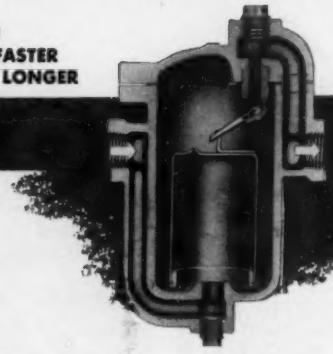
SKF INDUSTRIES, INC., Phila. 32, Pa.

manufacturers of

SKF and HESS-BRIGHT *bearings*

Here's the Trouble-Saving Trap for Low Pressure Vacuum Return Heating

IT GIVES YOU MORE HEAT, FASTER —AND LASTS LONGER



"50% REDUCTION IN STEAM TRAP MAINTENANCE since installing Armstrongs on 5 psi system with vacuum return."—John Deere Ottumwa Works, Ottumwa, Iowa,

"HEAT-UP TIME CUT 10%. Only $15.00 annual maintenance on 300 traps on low pressure vacuum return heating system." —John Deere Harvester Works, East Moline, Illinois.

ARMSTRONG inverted bucket steam traps are real *trouble-savers* on low pressure heating systems for these quickly understandable reasons:

1. No Trouble Holding Vacuum — you can't hold return line vacuum with leaky steam traps. Armstrong's *stay* steam-tight — often go for years without repairs. You get a big bonus in steam and fuel savings, too.

2. No Trouble with Corrosion — air and CO_2, particularly in unit heater coils, cause serious corrosion. Every time an Armstrong trap opens there is a momentary pressure drop that "pumps" air down to the trap where it is discharged along with condensate.

3. No Trouble Getting Fast Heat-up — Armstrong traps quickly draw off air that retards heat-up. Where large amounts of air are encountered when steam is turned on, traps with big thermically-operated bucket vents are available with capacity to handle 500 to 1500 cu. ft. of free air per hour.

4. No Trouble Keeping Heating Units HOT — Armstrong traps discharge condensate *at steam temperature* as fast as it accumulates. This keeps heaters packed with hot, dry steam for top BTU output.

5. No Trouble with the Traps — There is nothing to stick, clog, leak or collapse in an Armstrong trap. The hardened chrome steel valves and seats in traps for heating service are identical in design, workmanship and materials to those in Armstrong traps for service at 1500 psig, 900°F. Interior trim is corrosion-resistant 18-8 stainless. No wonder they last so long with so little attention!

Armstrong traps are guaranteed to give you satisfaction or your money will be refunded. They are guaranteed against defects *forever.* Call your local Armstrong Representative for the traps you need now. ARMSTRONG MACHINE WORKS, 874 Maple Street, Three Rivers, Michigan.

SEND FOR THE 36-PAGE STEAM TRAP BOOK FOR COMPLETE DATA

ARMSTRONG STEAM TRAPS

IT ALWAYS PAYS TO SPECIFY

LADISH

Controlled Quality

PIPE FITTINGS

...When you judge by Operating Statements

Maximum strength and endurance to minimize shutdown losses and replacement costs... these are important operating economies you can trace directly to the laboratory safeguards of Ladish Controlled Quality. Advanced metallurgical controls over materials and forging methods assure complete dependability in every Ladish fitting.

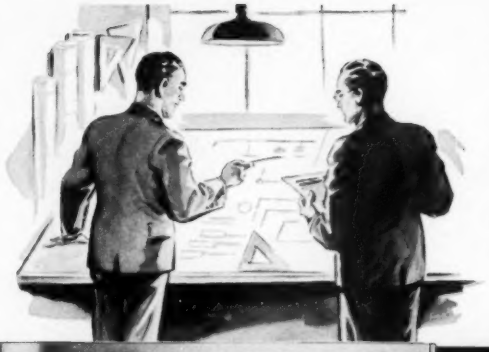
TO MARK PROGRESS

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

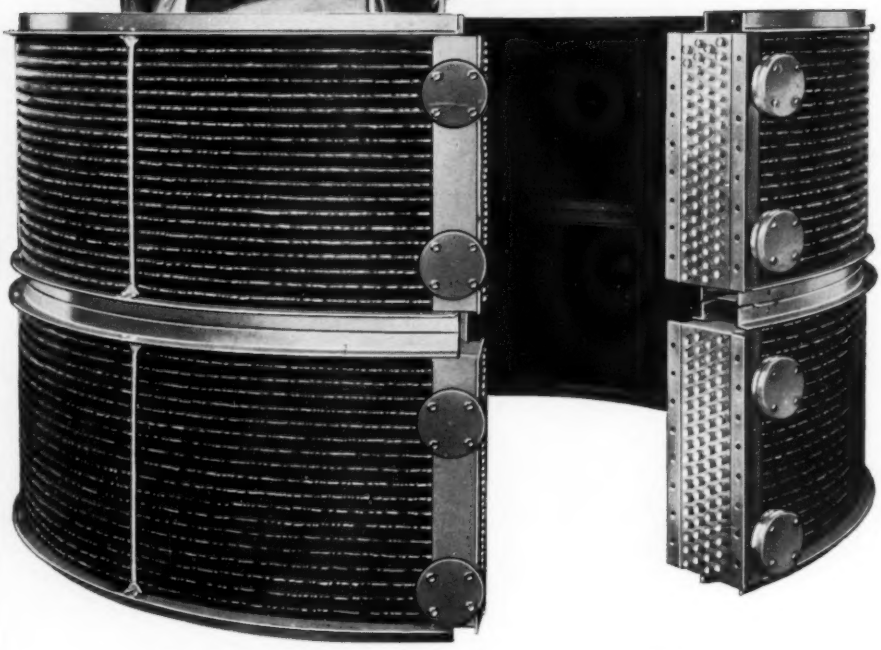
LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • Havana • Toronto • Mexico City



"Ask the AEROFIN Man"



For the Practical Answer to Your Heat-Exchange Problem . . .

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

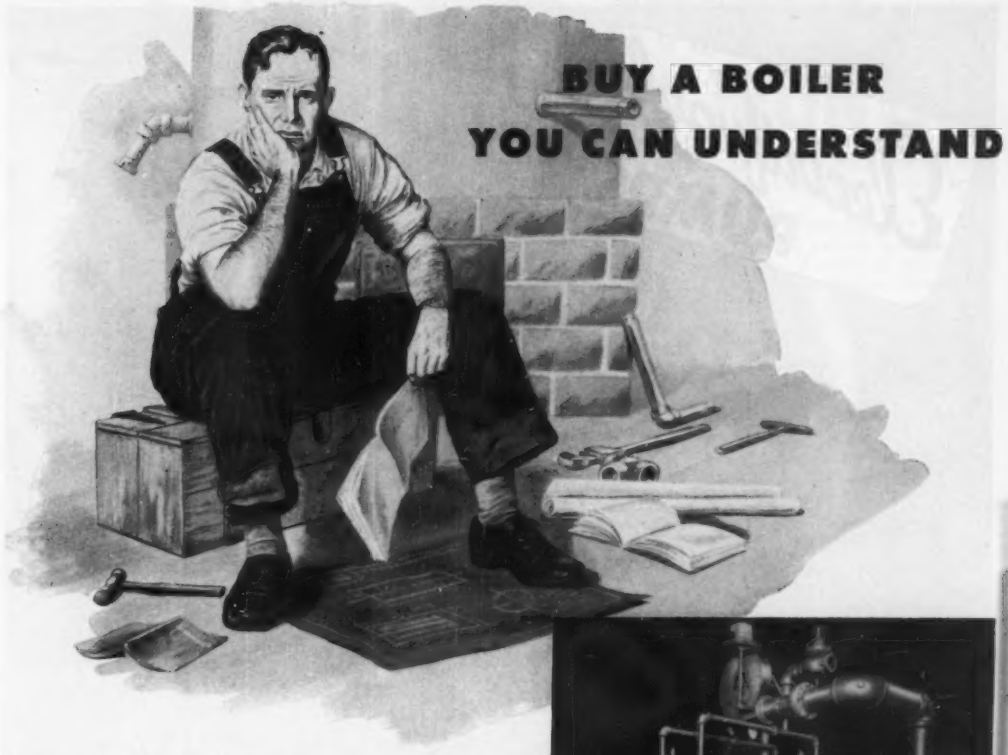
This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

AEROFIN CORPORATION

410 South Geddes St., Syracuse 1, N. Y.

NEW YORK • BOSTON • CHICAGO • CLEVELAND • DETROIT • PHILADELPHIA • DALLAS
SAN FRANCISCO • MONTREAL • TORONTO



You don't need to be an Einstein or an atomic scientist to understand a Sellers Immersion Steam Boiler.

The advantages of the Sellers immersion firing principle are apparent because it is based on practical engineering and common sense. Every pound of metal in a Sellers is strictly functional. Every tube and turn is designed and located for maximum efficiency and safety, for steam production at lowest cost.

In a Sellers:

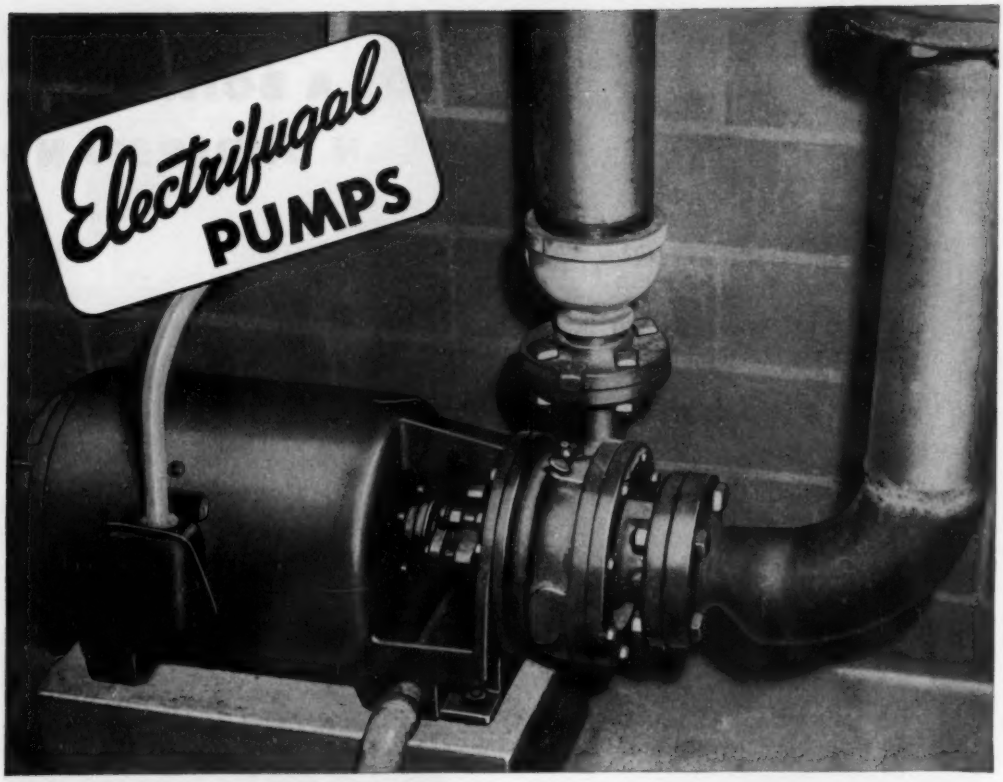
1. Firing tubes are completely submerged. All the **heat** goes directly into the water. Maximum heat transfer. No water line corrosion.
2. Water surface area is nearly three times that of a conventional boiler of comparable capacity.
3. There is no separate enclosed combustion chamber. No explosion hazard, no brick linings to replace, no carbon traps.
4. Expansion and contraction of firing tubes effectively combats scale.

Sellers Immersion Steam Boilers are available in twelve sizes to meet all standard requirements. All are built to A. S. M. E. Power Codes. It will pay you to get the complete Sellers story. Write for bulletin No. 1206C, today.

Buy A Sellers IMMERSION STEAM BOILER

SELLERS ENGINEERING COMPANY
4876 North Clark Street, Chicago 40, Illinois

Blast Heaters • Immersion Automatic Water Heaters • Vertical Steam Boilers • Air Heaters • Combustion Units • Industrial Gas Burners • Immersion Tank Heaters • Gas Combustion Equipment



Quick, Easy Installation

SAVE INSTALLATION TIME AND COST by standardizing on Allis-Chalmers package pumps for air conditioning and heating. The complete pumping unit comes in one piece, ready to run. Simply bolt the pump to the floor, connect power and piping and you're ready to pump. No special foundation is required, no coulings or other extra parts.

Because the frame is one solid piece of rigid, corrosion resistant cast iron from motor end bell to the pump mounting flange, alignment is perfect and permanent. No alignment time is required on the job, and it is nearly impossible to disturb the alignment during installation.

Nation-wide Engineering Help and Certified Service

Every Allis-Chalmers pump representative is a competent application engineer who will help you select exactly the right pump for your application. He can save you many hours of engineering time and many dollars of engineering cost. And 94 Certified Service shops throughout the country provide factory-approved parts and repair service to your customers.

Call your Allis-Chalmers Authorized Dealer or Sales Office next time you have a pump problem. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletins 52B7529 and 52B6140. A-3323

Electrifugal, Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

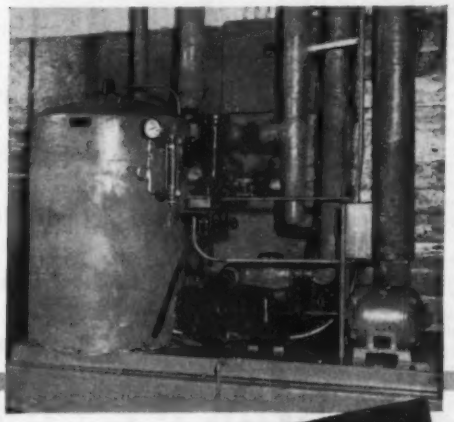
TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

BOILER FEED SYSTEM SAVES ITS COST IN 9 MONTHS

Here are actual costs, taken directly from the user's* records, to show the kind of savings that are being achieved with the revolutionary Johnson High Temperature Boiler Feed System.

This installation involves two 150 Hp. boilers operating at 125 lbs. pressure, served previously by a duplex steam pump. Comparison between the two systems for matching 30-day periods shows these facts: the Johnson System saves enough in increased thermal efficiency, reduced power requirements and maintenance to retire its cost in 8½ months.

It's been a long time since a development of such importance has come along, and proved itself so thoroughly on job after job. You'll want to re-examine your ideas of boiler feeding in the light of these facts. Better yet, why not let our nation-wide engineering organization survey your needs without obligation.



Here are the Actual Figures:

COAL CONSUMPTION			
30-day period (Steam Pump)	117 tons 50 lbs.		
Same period — 12 months later (Johnson System)	87 tons 75 lbs.		
Savings	30 tons (approx.) @ $10.85		$325.00
SALT Savings (for water softening) Requirement reduced 50%			15.50
WATER Savings			
Water for cooling returns eliminated			27.00
Water for backwashing reduced 50%			28.50
MAINTENANCE and **OIL** on Steamp Pump			
		Gross Savings	$394.50
		Added Electric Load	9.50
		Total net savings, one month	$385.00

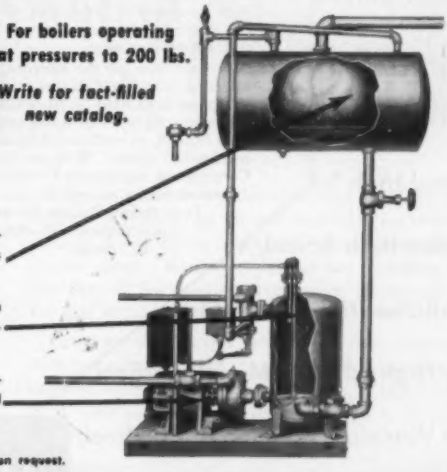
Cost of Johnson System	$2,324.53
Installation cost (Approx.)	1,000.00
	$3,324.53

Savings ($385.00 per month) will pay complete installation ($3,324.53) in less than 9 months.

High Temperature

For boilers operating at pressures to 200 lbs.

Write for fact-filled new catalog.



1 **Saves Fuel—as much as 20%.** Stabilizing the pressure here to keep condensate at 260°F. or higher does the trick.

2 **"Pressure Equalizing"**—the principle that permits a closed system, greatly reduces vapor losses and make-up requirements.

3 **Slashes Power Cost—as much as 60%.** For example, a 1¼ Hp. motor serves where conventional pump needs as much as 10 Hp.

*Nationally-known clothing manufacturer; name on request.

Products of The

806 Wood Street, Three Rivers, Michigan

Rotary Pressure Joints • Compressed Air Separators and Aftercoolers
Direct Operated Solenoid Valves • "Instant" Steam Water Heaters

Northwestern · Mount Holyoke College · Perry High School, Pittsburgh · Hood College
Columbia · Dundee Central School, N. Y. · Carnegie I… gy · Clemson
Amherst · McKinley School, Schenect… urdue · Lehigh
Goshen Central Sch… Ohio University
Pennsylvania Sta… ornell · Bucknell
Oklahoma A and… sity of Mississippi
Rensselaer Polyte… Hamilton · Kenyon
St. Francis Colleg… on-Newman College
Mississippi South… Vashington University
Tennessee Polyte… Ohio State · Vanderbilt
Davidson · Ober… St. Patrick's School, Troy
Virginia Polytech… Seneca School, Rochester
Lafayette Univers… elmont High School, Mass.
Connecticut Colle… St. Mary's School, Elizabeth
South Carolina St… he Principia School, St. Louis
Ashland High Sch… oward Park School, Baltimore
Brandon High School, … Howard High School, Nashville
Benedictine High School, Cleve… uhlenberg · University of Idaho
Perry High School · Marietta School, … ake Forest · University of Florida
West Virginia · Menden High School, … of Alabama
Luther Burbank School, Detroit · Palm… of Colorado
Ensley High School, Birmingham · Pe… of Chicago

Choose your Stokers with Confidence

from this background of experience

In schools and colleges – large and small – throughout the country you'll find Combustion stokers and boilers. The background of this page is formed by the names of some of these institutions chosen at random from a list many times larger. Here is a background of experience built on an outstanding record of service in hundreds upon hundreds of school installations. You can, therefore, select Combustion equipment with confidence that comes from the knowledge that it has proved its merit over and over – year after year – in installations similar to yours.

Furthermore, you can expect more than minimum specification requirements when you choose Combustion equipment. For, as one of the world's largest manufacturers of stokers and boilers, Combustion Engineering – Superheater, Inc. is accustomed to meet the exacting standards which characterize large power station installations. It is only natural, therefore, that you find incorporated in *all* C-E equipment those same high standards of design and manufacture that make for the most dependable and efficient performance.

Moreover, you get the advantage of a wide selection from the C-E line . . . the most complete in its field . . . since Combustion offers you all types of water tube and fire tube boilers, as well as all kinds of mechanical stokers. Why not investigate Combustion equipment for your next school job? Catalogs of various C-E Stokers and Boilers are available upon request. No obligation, of course. B-350

C-E

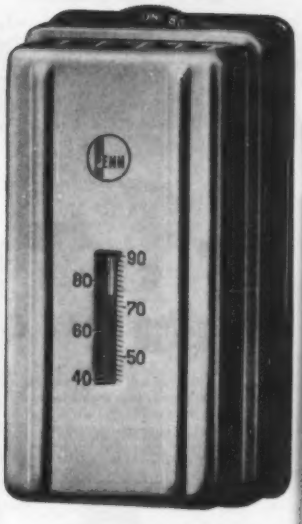
COMBUSTION ENGINEERING–SUPERHEATER, INC.

A Merger of Combustion Engineering Co., Inc. and The Superheater Co.

200 Madison Avenue · New York 16, N.Y.

summer ventilation

winter fuel economy



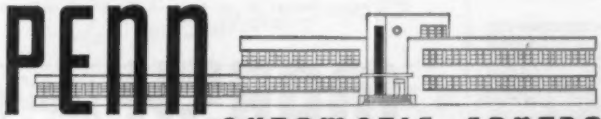
with 1 Unit Heater Control

A *built-in ON-OFF switch* is one of the PLUS VALUES in the PENN unit heater thermostat which enables you to get *two jobs* done with one control.

During winter months, this switch is a great *fuel-saver.* A mere rotation of the dial to "OFF" position stops heat flow during idle periods . . . or to little used areas . . . or to areas where heat can escape, such as receiving or shipping rooms which may be exposed to outside temperatures for long periods. In addition, the PENN heat-anticipating thermostat holds temperatures closer to the selected level . . . eliminates wasteful "zig-zag" heating.

Then in summer months, this same ON-OFF switch makes it possible to use the unit heater fan for *ventilation* without installing an additional switch. The ON-OFF feature permits manual control of fan operation whenever desired. For continuous operation, you merely rotate the dial to ON position.

Learn more about this *better control* for unit heaters. Ask your manufacturer, wholesaler or write **Penn Electric Switch Co., Goshen, Indiana.** Export Division: 13 E. 40th St., New York 16, N. Y., U.S.A. In Canada: Penn Controls, Ltd., Toronto, Ontario.

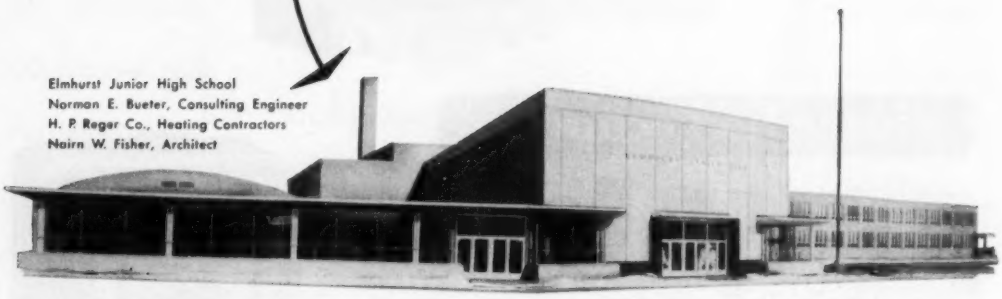


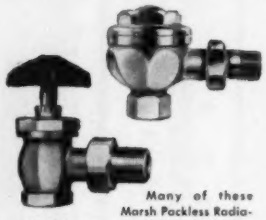
AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

What equipment but MARSH ...for a model school building like this?

Elmhurst Junior High School
Norman E. Bueter, Consulting Engineer
H. P. Reger Co., Heating Contractors
Nairn W. Fisher, Architect



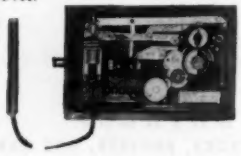


Many of these Marsh Packless Radiator Valves were used in the elaborate heating system of the Elmhurst Junior High, and a large number of thermostatic traps were used in connection with radiators and coils.

The Marsh No. 8 float and thermostatic trap, illustrated, is typical of many traps of this kind used in the Elmhurst school.

BIG SAVINGS WITH MARSH—TRITROL—heat regulation in step with the weather

By controlling inside heat in accordance with outside temperature, Marsh Tritrol gives ideal comfort at minimum cost. Installation is simple. Cost remarkably low. Ask for Bulletin S-750.



A lucky throng of boys and girls have just begun classes in the newly completed Junior High School at Elmhurst, Ill., a suburb of Chicago. One of the finest junior high schools ever built, the expansive structure houses a large gymnasium, a totally separate auditorium seating 900, a large, pleasant cafeteria, spacious well-equipped classrooms—facilities far beyond those of the old-time schools their dads and mothers knew as full fledged high schools.

In the rapid advance of school buildings during recent years, no phase has seen greater improvement than heating and air conditioning, and this model school is a particularly good example of this. No expense has been spared in any detail of the vacuum system to make it functionally and permanently effective. So it is significant that Marsh Traps and Valves were chosen for the vital job of keeping heating coils, mains and risers free from air and condensate throughout the entire heating system.

The use of Marsh equipment here is just one more example of advanced heating systems in outstanding buildings all over America in which Marsh heating equipment has been the first choice of foremost consulting engineers, heating contractors and architects. Use Marsh traps, valves, vents, and controls on that next job and you will know why Marsh has been so often accorded top preference for uncompromising quality, for consistent performance, for downright *value*.

Ask for new Catalog 76-H covering Marsh packless valves, radiator traps, float and thermostatic traps, inverted bucket traps, float traps, return traps, air traps, air vents and boiler gauges.

MARSH HEATING EQUIPMENT CO.

Sales affiliate of Jas. P. Marsh Corporation • **Dept. T, Skokie, Ill.**

MARSH *Heating Specialties*

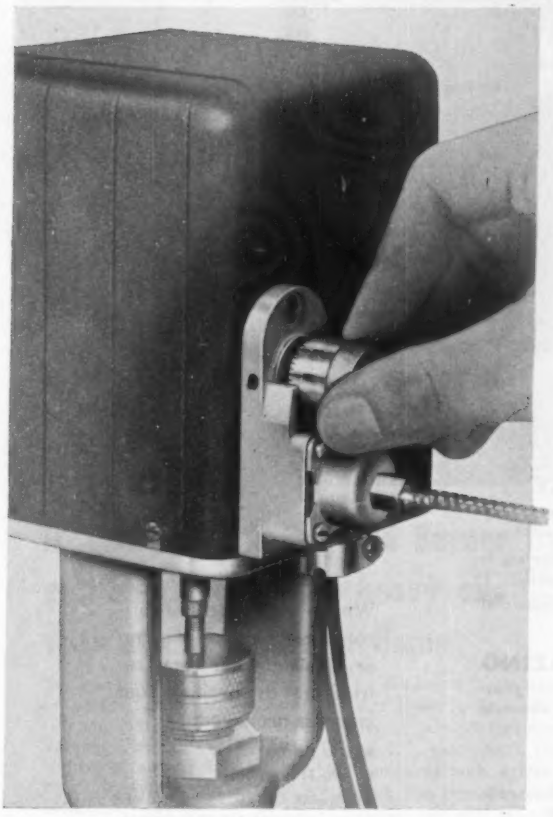
SINCE 1865

Announcing!

the new

BARBER COLMAN

self-contained
electrically operated
TEMPERATURE REGULATORS



Featuring!

CALIBRATED dials

TWO MODELS—
Standard Sizes

Model ADFE for 1/2" to 2" pipes (6 sizes). Standard electric motor-operator. Positive *motor-driven* power operator closes valve *tightly*. Tight-closing ability does not diminish with time. Delivered completely assembled, ready for installation. Temperature range, choice of 50°-130° or 120°-200°F. with calibrated dial.

Model FYBE for 3/4" to 4" pipes (8 sizes). Has heavy-duty motor-operator for installations involving higher pressures and larger capacities. Other features same as Model ADFE, including same choice of temperature ranges. Both models connect direct to 60-cycle A.C., 115 or 230-volt as specified.

for **HOT WATER STORAGE TANKS**
BOTTLE WASHERS
BATCH KETTLES
and other two-position on-off applications

Write for Literature
Ask for Bulletin F-4695

BARBER-COLMAN COMPANY
1228 ROCK STREET • ROCKFORD, ILLINOIS

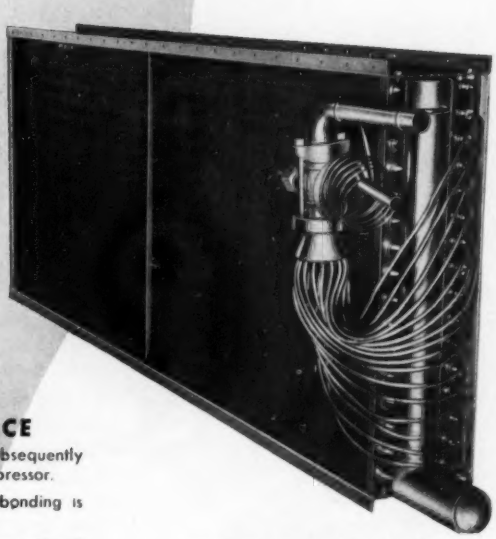
BARBER COLMAN

We can't *make* ***all*** *the*

Heat Transfer Surface

So we make the ***Best*** *of it*

ONLY KENNARD *Engineered* COILS



Give You so Much...

CLEANER INSIDE SURFACE

Hydraulic stretching loosens scale and oxides subsequently blown OUT of coil reduces danger of scoring compressor.

SAFER COIL—Having withstood 3000 psi for bonding is safe-guarded against leaks.

UNIFORM EVEN STRESS—in ALL fins—good mechanical and thermal bond.

NITROGEN ATMOSPHERE BRAZING

All header and distributor tube joints to the coil are phos-copper brazed in an inert Nitrogen Atmosphere to eliminate abrasive scale.

NO-RUST FRAMES

Frames up to 72" are ALUMINUM. Larger sizes framed in steel, hot-dipped galvanized AFTER FABRICATION.

ONE-PIECE FINS *(ALL LENGTHS)*

Solid plate type fin for ALL coils. Reduces air resistance. Requires less fan power. Minimizes fuzz and lint fouling.

*Underwriters Laboratories Approval**

*Does not apply to water and steam coils — not required

We are equipped to fabricate ANY type of Heating or Cooling Coils (any refrigerant) as specified. Your inquiries are invited.

Write for Bulletins—

No. 47A—FINNED COILS

No. 486—AIR CONDITIONING BLOWER UNITS

No. 491—EVAPORATIVE CONDENSERS

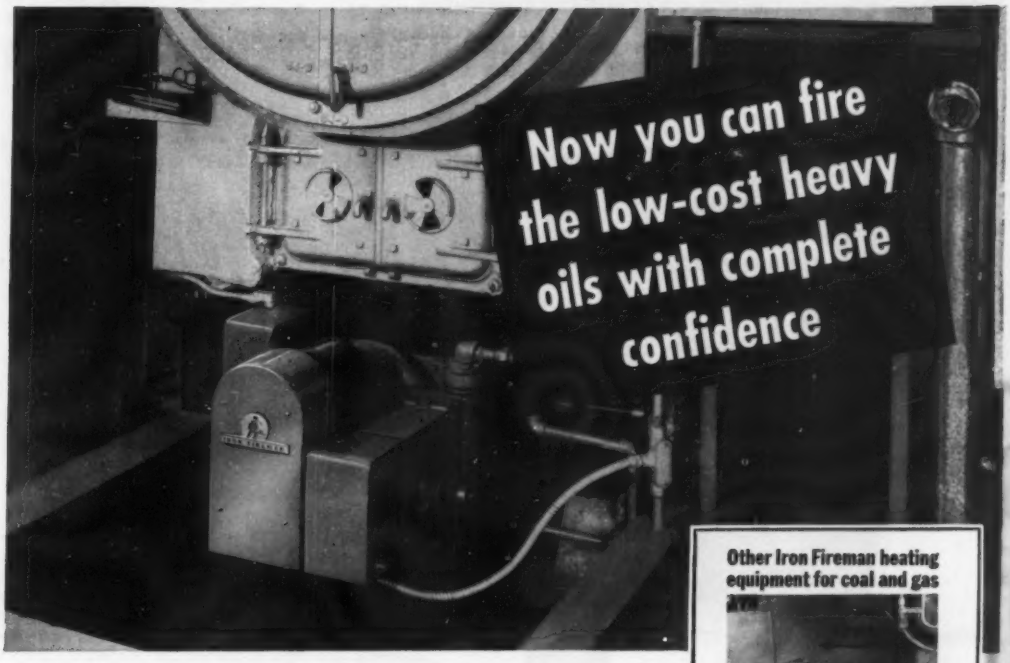
No. 494—COOLING TOWERS

"Refinement of Detail Marks the Difference Between Ordinary and Excellent"

KENNARD CORPORATION

1817 S. HANLEY RD., ST. LOUIS 17, MO.

Cut Heating Costs



Iron Fireman Rotary Oil Burner fires economical heat-rich heavy oils (Nos. 5 and 6) with steady, uniform flame

The Iron Fireman Horizontal Rotary oil burner handles all grades of oil —from lightest to heaviest—with accuracy and precision. The Oil Volumeter meters the oil to the nozzle by *volume*—not by the old-fashioned methods of viscosity compensating valves or adjustable ports. This precision feed results in a steady, uniform flame, even when throttled down to less than 20% of capacity. Dependable oil flow results in thorough reliability, even when starting up in a cold boiler.

The heavy fuel oils (Nos. 5 and 6) are lower priced than ordinary burner oils, yet they may contain up to 12% more Btu's per gallon, as compared with lighter oils. Thus, with the precision firing of these heavy oils you save in two ways —in the cost per gallon and the amount of heat obtained per gallon.

For further information write for new illustrated 16-page booklet, "The Iron Fireman Horizontal Rotary Oil Burner."

Other Iron Fireman heating equipment for coal and gas

Coal-Flow Stoker
Feeds coal directly from bin to fire. Capacity from 30 to 400 boiler horsepower.

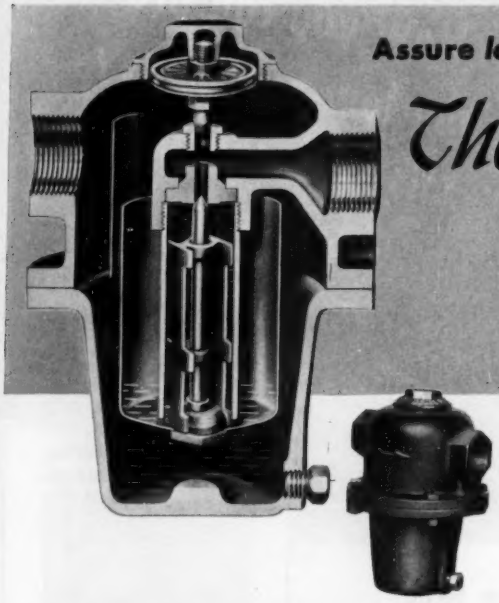
Pneumatic Spreader Stoker
Easily adaptable to all boiler room layouts. Fires all grades of coal efficiently, including sub-bituminous and lignite. Capacities to 1000 boiler h.p.

Commercial Gas Burners
Efficient, dependable, labor-saving. Easily installed. Capacities to 400 boiler h. p.

Write for folders on any of this outstanding industrial equipment

IRON FIREMAN
MANUFACTURING COMPANY
3154 WEST 106TH STREET · CLEVELAND, OHIO

ILLINOIS
Float & Thermostatic TRAPS



Assure *lower* return line temperatures

They're different!

–in construction

–in performance

ILLINOIS Float & Thermostatic Traps operate under vacuum with the same high efficiency as under pressure. No more water-logging of mains . . . no more air binding . . . end "morning overload" troubles. The instantaneous action of the condensate valve assures complete drainage of condensate. A separate thermostatically controlled valve vents air continuously in large volume, yet positively prevents loss of steam.

Recommended Applications

Low Pressure Heating Systems, Ventilating Units, Unit Heaters, Pre-Heaters, Re-Heaters, and other Fan System Heat Surface, Large Radiators or Pipe Coils, Hot Water Generators, Drips of Mains and Risers. Draining Coffee Urns, Warming Tables, Pasteurizers, Vacuum Pans, Heat Exchangers, Process Heaters, Sterilizers, Autoclaves, Cooking Kettles, Kilns and similar equipment.

(For operating ranges from 25 inches vacuum to 15 pounds pressure use Series G Traps. For pressures up to 50 pounds use Series MG.)

Rated capacities of various size traps from 200 pounds to 5000 pounds condensate per hour, at 2 pounds differential across the trap.

Positive, Instantaneous Valve Action . . . an Exclusive Feature

The Snap Action of the Condensate Control Valve assures efficient trap operation. The valve is not directly attached to float but is actuated by impact of the dropping float. Valve action is instantaneous whether the trap is handling its maximum capacity or only a trickle of condensate and regardless of variation in pressures. The valve is either wide open or tight shut—never cracked on seat, never hanging in an intermediate position. It is water-sealed at all times. It cannot chatter and is never affected by pulsations in the flow of condensate to the trap.

Simple, Compact, Trouble-proof

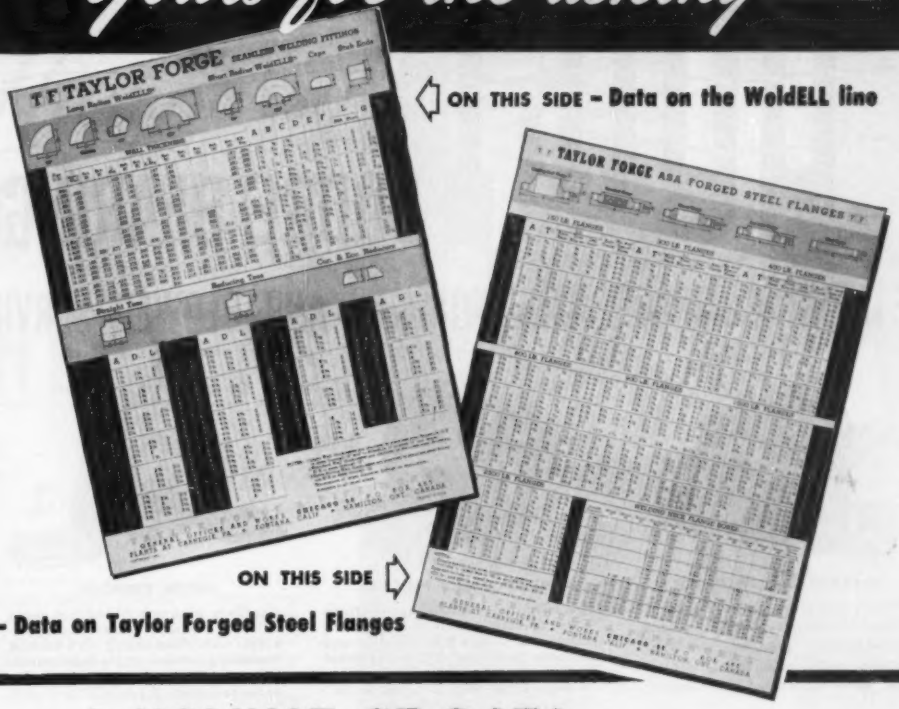
No ball floats to puncture or collapse—no toggles, pins, levers or hinges to corrode, stick or bend. Hard, stainless alloy steel renewable valves and seats are used for both condensate and air bypass units. Both valve units are at the top of trap out of dirt and sludge, assuring long life and satisfactory operation without attention. Straight through connections save head room, fittings, trenching, labor, and avoid low hung piping or lifts. Trap is easily opened for inspection without disturbing piping.

TRAP NOT DAMAGED BY FREEZING. Freezing will not harm this trap in any way and it is self-thawing.

Write for Bulletin 34-C

ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

Yours for the asking—


T F TAYLOR FORGE
ON THIS SIDE – Data on the WeldELL line
TAYLOR FORGE ASA FORGED STEEL FLANGES
ON THIS SIDE
– Data on Taylor Forged Steel Flanges

A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

T F

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME_____

POSITION_____

COMPANY_____

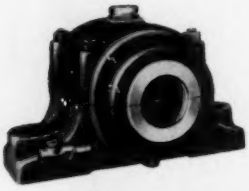
STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

510-0351 Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

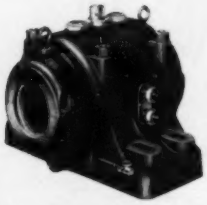
QUIET DODGE BEARINGS

THE MOST COMPLETE LINE FOR FAN AND BLOWER SERVICE



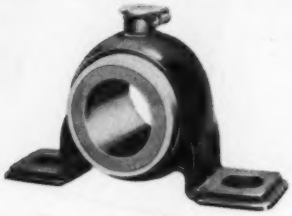
SLEEVOIL PILLOW BLOCK

A precision-built, ring-oiling babbitted bearing, self aligning and exceptionally quiet in operation. Special seals prevent oil leakage and keep dirt out of the bearing.



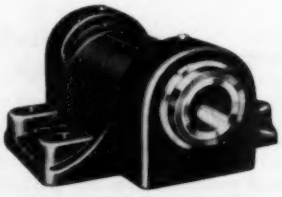
WATER-COOLED SLEEVOIL

Specially designed for applications where elevated temperatures are encountered. Dodge Sleevoil bearings combine quietness with exceptional load carrying capacity; are available in shaft sizes from 1-11/16" to 8".



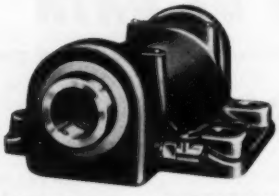
DODGE BRONZOIL

Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Oil resistant grommets available for noise isolation. Sizes 1/2" to 1-1/4".



BALL BEARING PILLOW BLOCK

Single row, deep groove ball bearings. Inner race extended to form sleeve which carries shaft. Piston ring seals retain lubricant, exclude dirt. For arrangement No. 2. Shaft sizes 15/16" to 2-1/4".



BRONZE BUSHED PILLOW BLOCK

Designed for arrangement No. 2 installations. Two bronze bushings of high lead content and T section rings, sealed against dirt. Composition rings inside thrust collar prevent oil leakage. For shaft sizes 15/16" to 2-3/16".

CALL THE TRANSMISSIONEER
your local Dodge distributor, for information about the entire Dodge line of bearings for fan and blower service. Look for his name in the Classified Telephone Directory under "Power Transmission Equipment." Or write to the factory.

DODGE MANUFACTURING CORPORATION
1600 UNION ST., MISHAWAKA, IND.

DODGE
of Mishawaka, Ind.

FIRST IN POWER TRANSMISSION MACHINERY

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT ETCHING CORPORATION, 1555 N. SHEFFIELD AVE., CHICAGO, ILLINOIS

Humphrey GAS UNIT HEATERS

Dependable... Economical... Efficient

The demand for gas fired unit heaters is increasing steadily because of their many *plus* advantages . . . advantages that include saving of floor space, economical installation and operation, cleanliness, elimination of boilers and fuel storage. Humphrey Gas Unit Heaters are the finest that over 50 years experience in building gas heating equipment can produce . . . when you sell a Humphrey, you sell complete customer satisfaction.

Available in sizes from 65,000 to 200,000 BTU input ratings; Rotor Type available with louvers or duct adapter.

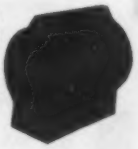
ONLY Humphrey HAS ALL THESE ..... QUALITY FEATURES

SUPER COMBUSTION CHAMBER — Completely new, all steel with special stainless steel lifetime "dual flame" burner tips.

POSITIVE SAFETY CONTROLS—Basoid Safety Pilot shuts off gas in event of pilot outage, Humphrey overload assembly eliminates danger of overheating due to any cause.

ADJUSTABLE LOUVERS — Horizontal or vertical louvers available . . . easy control of angle at which heat is directed downward at desired level.

FREE FLOW HEAT EXCHANGER — Heavy gauge steel, welded for strength and gas-tight construction. Large area, streamlined surface, effects rapid transfer of heat. No baffles to impede flow. Requires no cleaning.



Radiantfres

Circulators

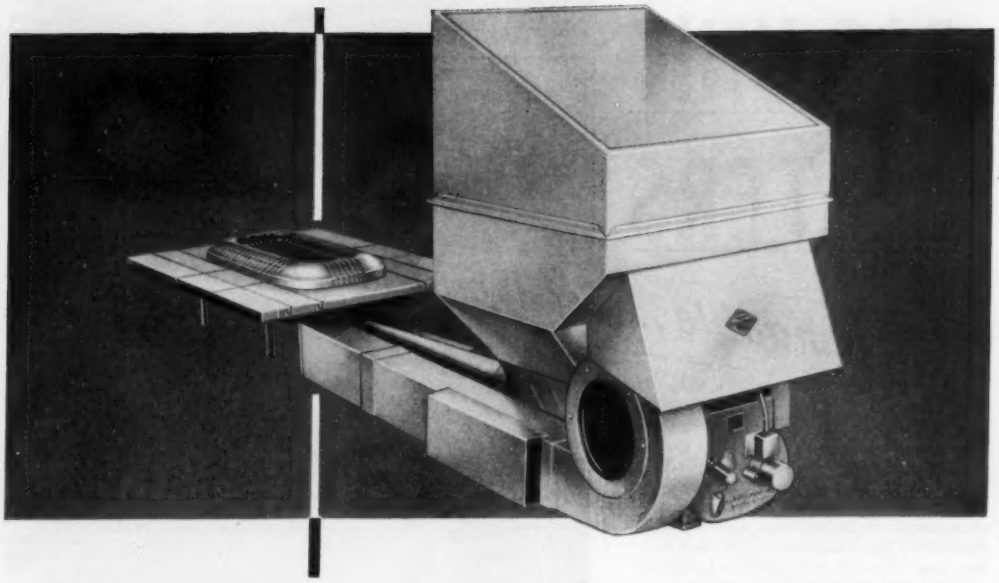
GENERAL GAS LIGHT COMPANY

KALAMAZOO, MICHIGAN

Wall Heaters

Unit Heaters

A WILL-BURT STOKER
makes a good coal-heat installation BETTER

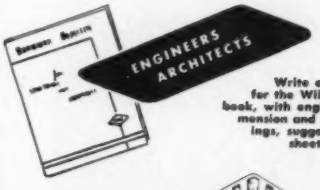


There is no guess-work when you specify or install a Will-Burt stoker. Its design, materials and workmanship are the result of 20 years of field and engineering experience.

The effective, trouble-free Will-Burt automatic air control is one of the important Will-Burt contributions to efficient combustion and smoke abatement. In fact, Will-Burt ORIGINATED the application of air control to stokers within the Will-Burt size range. The Will-Burt air-control device has proved its superiority throughout these many years.

The quality which characterizes EVERY detail of a Will-Burt stoker insures approval by the buyer for him who specifies or installs a Will-Burt. Will-Burt stokers build reputations . . . year after year after year.

They are available in a full range of sizes, hopper and bin fed, in capacities up to 600 pounds per hour.



Write on your letterhead for the Will-Burt stoker data book, with engineering facts, dimension and installation drawings, suggested specification sheets, etc. Valuable!

OTHER WILL-BURT HEATING PRODUCTS

Gas and oil conversion burners

Residential hot-water heating boilers

WILL-BURT

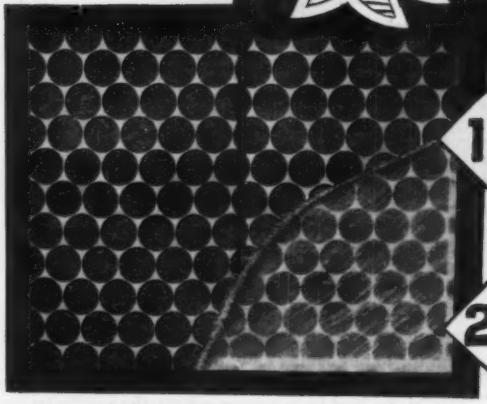
THE WILL-BURT COMPANY

DEPARTMENT H ORRVILLE, OHIO

DUST IS OUT BECAUSE IT'S IN*

The NEW IMPROVED Glasfloss AIR FILTER

IMPINGEMENT G STRAINER



1 THE STANDARD HIGH EFFICIENCY GLASFLOSS AIR FILTER PAD....

PLUS

2 GLASFLOSS STRAINER MAT THAT MAKES DUST FILTERING UP TO 98% EFFICIENT!

Dust is OUT of the air because it's permanently trapped IN the new, improved Glasfloss COMBINATION IMPINGEMENT-STRAINER TYPE AIR FILTER. Higher efficiency factor of 95% to 98%. Resistance, normal.

To the famous, long fine glass fibres of the standard Glasfloss unit has been added our exclusive **STRAINER MAT** feature. Combined, these two elements excel for dust and dirt air filtering. The improved Glasfloss **IMPINGEMENT-STRAINER AIR FILTERS** are available in 2" thicknesses—in all standard sizes. They broaden your sales opportunity because they are ideal for paint-spray booths in automotive, aircraft and enameling operations; for food processing plants; pharmaceutical and soap manufacturers; television studios; restaurants and dining rooms; hospitals, schools and all public buildings—anywhere in the business and industrial world and where clean air is important. Increased profits, more satisfied customers are the plus values you can expect from Glasfloss **IMPINGEMENT-STRAINER** Air Filters. Write today for complete information. Address Dept. HP-2.

Glasfloss 155 EAST 44th STREET, NEW YORK 17, N. Y.

fishin' is fun . . .
with care on the run

Here's a fellow that enjoys complete relaxation. He knows his plant is safeguarded from fire . . . a short circuit, a stray spark, a forgotten cigarette or spontaneous combustion can't cut into production time, destroy valuable records or endanger the lives of employees.

You too, can have this same peace of mind about fire by fully protecting your investment in materials, equipment and buildings with modern, approved C-O-TWO Fire Protection Equipment.

No matter what your property . . . factory, mill, warehouse, power station or research center . . . or a particular fire hazard such as spray booth, dip tank, pump room, electrical equipment enclosure or record vault . . . there is a type of C-O-TWO Fire Protection Equipment that gives you fast, positive action the instant fire strikes. Whether it's a C-O-TWO Squeez-Grip Carbon Dioxide Type Fire Extinguisher for an incipient fire, or a C-O-TWO Built-In High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System for total flooding an entire fire hazardous area . . . C-O-TWO means experienced engineering that assures you of the best type equipment for the particular fire hazard concerned.

For example, at many locations a C-O-TWO Combination Smoke Detecting and Fire Extinguishing System is a "must". The first trace of smoke in a protected area sounds an alarm . . . then fast, clean, non-damaging, non-conducting carbon dioxide blankets the fire, putting it out in seconds, before it spreads and causes extensive damage.

So, let an expert C-O-TWO Fire Protection Engineer help you in planning complete and up-to-date fire protection facilities now. Write us today for complete free information . . . our experience is at your disposal.

C-O-TWO

C-O-TWO FIRE EQUIPMENT COMPANY

NEWARK 1 • NEW JERSEY

Sales and Service in the Principal Cities of United States and Canada

Affiliated with Pyrene Manufacturing Company

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

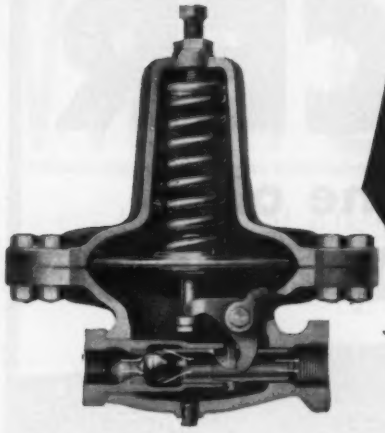
Squeez-Grip Carbon Dioxide Type Fire Extinguishers • Dry Chemical Type Fire Extinguishers • Built-in Smoke and Heat Fire Detecting Systems
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems

10 POINT *Results*

FROM

CASH STANDARD *Streamlined* TYPE 1000 PRESSURE **REDUCING VALVES**

THESE TROUBLEMAKERS FIND NO OPPORTUNITY TO PERFORM WITH THE "1000" ON THE JOB



A MANUFACTURER CHECKS THE 10 POINTS AND SAYS . . .
"We have 3 of these '1000' valves and all of them are giving good service."

THE 10 POINTS ARE CHECKED BY A RESEARCH FOUNDATION, THEY SAY
"These valves have been VERY SATISFACTORY BOTH IN OPERATION and MAINTENANCE. The MAINTENANCE COST IS ABSOLUTELY NOTHING once this '1000' valve is installed. Wherever any one may need CONTROLLED PRESSURE IN EITHER STEAM, AIR, or ANYTHING—this CASH STANDARD '1000' valve can be relied upon to do just that and TO GIVE CONTINUED TROUBLE-FREE service."

A MEAT PACKER SAYS IN CHECKING THE 10 POINTS . . .
"Very little maintenance required."

A STEEL CASTING CO. CHECKS THE 10 POINTS—THEY SAY . . .
"We find your CASH STANDARD Streamlined Type '1000' Pressure Reducing Valves to be VERY RELIABLE. We have a number of these valves in service throughout our plant, and have NEVER HAD ONE OUT OF SERVICE for any reason. These '1000' valves have been in service for approximately five years."

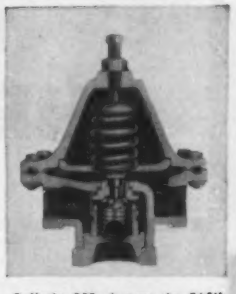
A MOULDED PRODUCTS CO. CHECKS THE 10 POINTS AND SAYS
"Maintenance time and cost very low."

These are the Points
USERS CHECK WITH . . .

1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

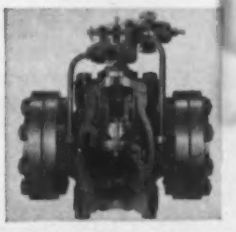
WRITE FOR BULLETIN 962

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.

Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

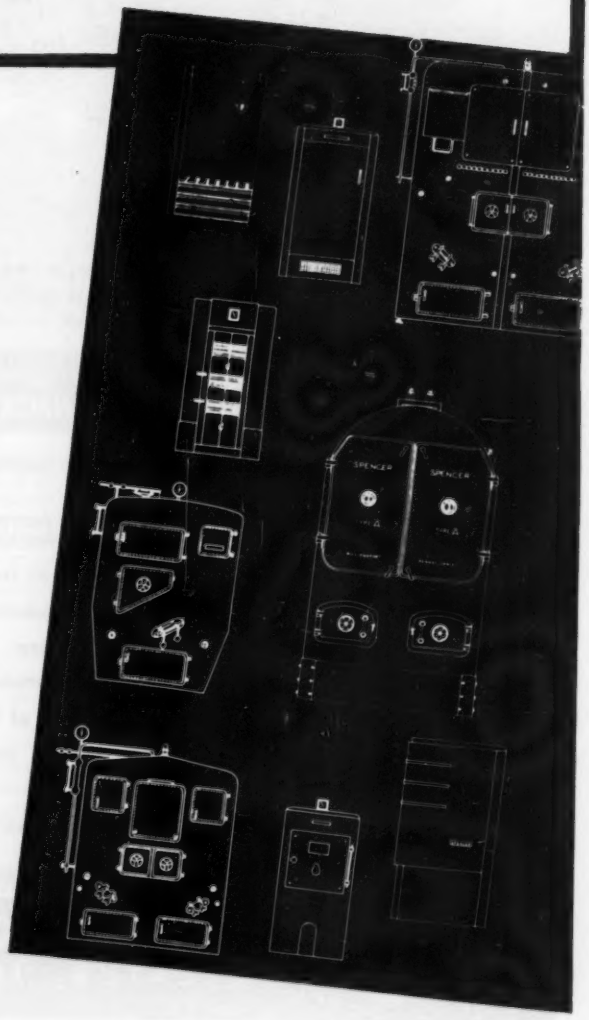
SPENCER

The Quality Line of HEATING BOILERS

VERSATILE
DEPENDABLE...

Backed by more than 60 years' leadership

There is a SPENCER for *every* building... for *every* fuel, with capacities from 290 to 45,000 square feet, steam. Precision engineered and manufactured to give superior, *guaranteed* service.



SPENCER
HEATER
LYCOMING-SPENCER DIVISION
WILLIAMSPORT LYCO PENNSYLVANIA

SBI

IBR

Constructed in accordance with ASME requirements. Fully approved by Steel Boiler Institute or Institute of Boiler and Radiator Manufacturers.

VARIETY

is not the spice of life here but it

Permits Piping Improvement

Midwest offers a large variety of welding fittings to help *you* improve *your* piping. Many of these fittings were originated by Midwest for the purpose.

For example, the Midwest Reducing Elbow saves a third of the welding, decreases turbulence and pressure drop and improves appearance when used instead of a standard elbow and reducer. Midwest Long Tangent Elbows have a tangent or straight section at each end equal to ¼ the nominal pipe size; this saves pipe, saves time in lining up, and often saves welding. (These are in addition to ASA Type and Short Radius Elbows.) Midwest Sleeves relieve the line butt weld of all bending stress and much of the tensile stress. Midwest Saddles restore the original pipe strength and reinforce the joint.

Use of Midwest Welding Fittings assures maximum improvement and economy in piping. For your welding fitting needs, get in touch with the Midwest Distributor near you.

MIDWEST

PIPING & SUPPLY COMPANY, Inc.

MAIN OFFICES: 1450 SO. SECOND STREET, ST. LOUIS 4, MO.
Plants: St. Louis, Passaic, Los Angeles and Boston.
Sales Offices: New York 7—30 Church St. • Chicago 3—79 W. Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.

MIDWEST WELDING FITTINGS Improve Piping Designs and Reduce Costs

Personal Weather Control
AIR CONDITIONING SYSTEMS

Before you build... before you modernize

SEE HOW G. E. CAN HELP YOU CUT AIR CONDITIONING COSTS

The adaptability and equipment advantages of G-E Personal Weather Control Air Conditioning produce important savings in multi-room buildings of all kinds

Air conditioning that satisfies both building requirements and tenant desires...and yet is often substantially lower in cost than other systems—that's what you get with General Electric Personal Weather Control. Designed to supply year 'round comfort in office buildings, hospitals, hotels, apartment houses, and other multi-room structures, these newly-improved G-E Systems feature unparalleled flexibility.

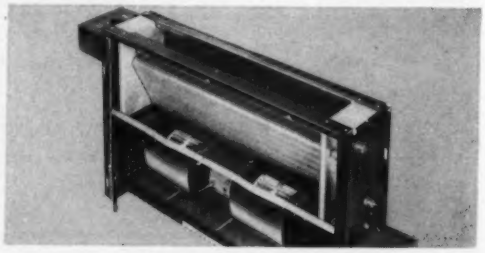
Building owners like the way G-E Systems can be quickly adapted to office rearrangement. Architects and engineers like the saving in space that is often possible because G-E Systems can be installed with small-size, high-pressure ducts or even without ducts. Tenants enjoy living and working in G. E.-air-conditioned buildings because they get individual room control of climate.

Here are a few of the ways you save!

LOWER INSTALLED COST! G-E Personal Weather Control Systems using the individual G-E Room Air Conditioner shown above often require substantially lower compressor capacity than competing systems. Application with small-size, space-saving ducts, or without ducts at all, can save both installation and building costs.

LOWER OPERATING COST! Since G-E Systems often require less compressor capacity, there's a saving in power cost too! Room units in unoccupied rooms can be shut off. When load conditions are reduced, units can be operated without running ventilation equipment. And G. E.'s filters help coils maintain top efficiency.

LOWER MAINTENANCE COST! All air—both room and ventilation—is filtered, protecting coils from dust and dirt which have been known to cut efficiency up to 15%. Simple, inexpensive filter replacement takes less than a minute. No costly coil cleaning.



LOWER REPLACEMENT COST! Attractive, rugged G-E Air Conditioners give top performance year after year. "Never had to replace one," says Clay J. Berry, The Fair Bldg., Fort Worth, where a 500-unit General Electric System was installed in 1939.

You can put your confidence in—

GENERAL ELECTRIC

General Electric Company, Air Conditioning Dept., Sec. HP-4, Bloomfield, New Jersey

Please send me, without obligation, detailed information on G-E Personal Weather Control Air Conditioning Systems.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

NEW TYPE HIGH PRESSURE
Hotel Air Conditioning System
PROVES GREAT SUCCESS

THE *Kentucky* HOTEL
WALNUT STREET AT FIFTH
LOUISVILLE 2, KENTUCKY

August 21, 1950

Mr. August Rust-Oppenheim, President
Anemostat Corporation of America
10 East 39th Street
New York, New York

Dear Mr. Rust-Oppenheim:

Using the new Anemostat High Pressure Induction-Type Diffusers was certainly the answer to our air conditioning needs. These units operate quietly. The volume control for modulating temperature works very well. Our guests feel more at home than ever in the comfortable, draftless environment of our hotel.

I wish to congratulate the Anemostat Corporation of America and Mr. S. O. Stevens of the Stewart Distributing Company, the Air Conditioning Contractor, on the excellence of this new type of hotel air conditioning. It was installed at low cost, with a minimum amount of construction alteration. Most importantly, the job was completed on time and without loss of room rental.

Sincerely yours,

THE KENTUCKY HOTEL

H.E.Harter, Managing Director

H. E. HARTER
Managing Director

S. O. STEVENS
Stewart Distributing Company

AC-1263

Write for further information

ANEMOSTAT®

DRAFTLESS *Aspirating* AIR DIFFUSERS

ANEMOSTAT CORPORATION OF AMERICA, 10 EAST 39th STREET, NEW YORK 16, N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

"No air conditioning system is better than its air distribution"

in the

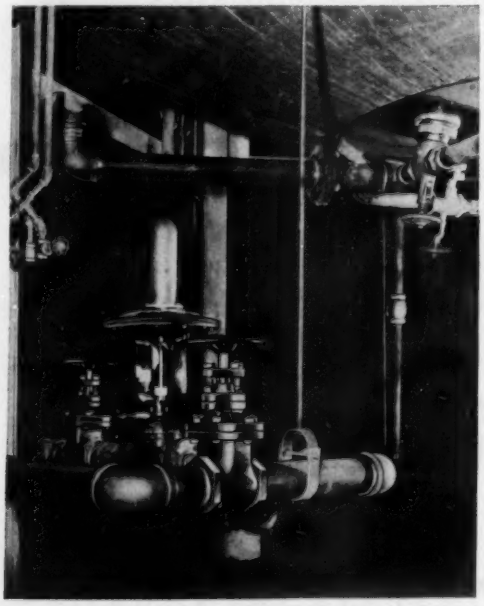
MOST ADVANCED buildings

such as at . . .

Lederle

JENKINS VALVES

are just what the doctor ordered



Valves for fermentation tank are among the thousands of Jenkins Valves installed in the 135 buildings of Lederle Laboratories' main manufacturing plant at Pearl River.

In its modern, integrated plant at Pearl River, N. Y., Lederle Laboratories Division, American Cyanamid Company, has as rigid a set of controls for the preparation of drugs, antibiotics, and biological products as any commercial laboratory in the world.

All operating equipment for processing of the various products must be thoroughly dependable. It will be no surprise to future-minded building planners that Jenkins Valves passed this "laboratory test" and are standard throughout the Lederle plant.

Jenkins Valves have been the choice, consistently, of leading architects, engineers and contractors for America's most progressive buildings—the skyscrapers, industrial plants, institutional and municipal structures that have set new standards in operating efficiency as well as design.

For Jenkins builds *extra* endurance into valves—proved by low upkeep cost records in every type of service. Yet, despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17; Jenkins Bros., Ltd., Montreal.

Sold through leading Industrial Distributors everywhere.

JENKINS

LOOK FOR THE DIAMOND MARK

VALVES

JENKINS MARK

Jenkins Bros

EQUIPMENT DEVELOPMENTS...

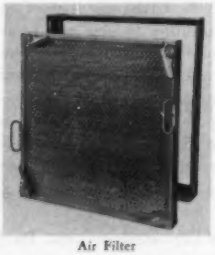
For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1951 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in your Directory Section; double asterisk, equipment and manufacturer not listed.

Air Filter

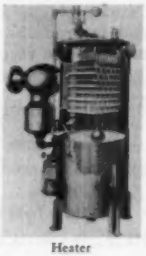
HPAC 1—A new high velocity unit air filter, type HV, has been introduced by American Air Filter Co., Inc., Louisville 8, Ky.

It is made of corrugated strips of fine mesh wire in which the corrugations taper so that when two strips are placed together they form a series of pyramid shaped pockets. The small ends of the pockets are closed to the air flow to eliminate open air passages through the media.

These filters are designed to operate at velocities up to 500 fpm and maintain a uniformly high cleaning efficiency over a wide range of air velocities. They can be serviced in the conventional way with washing and charging tanks or reconditioned by washing out the accumulated dust with a hose and spraying with filter adhesive.



Air Filter



Heater

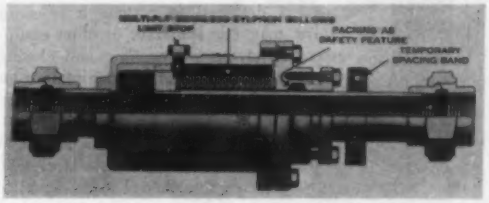
Feedwater Heater

HPAC 2—A new "Junior" feedwater heater designed specifically for small manufacturing plants, institutions, public buildings, dairies, laundries and greenhouses with boiler capacities of 300 hp or less has been developed by Swartwout Co., 18511 Euclid Ave., Cleveland 12.

It utilizes exhaust steam to heat the water before it is delivered to the boiler. Made of fabricated steel, the unit has specially designed stainless steel trays used to disperse feedwater in the form of thin curtains over a large area, so that the exhaust steam gives up its heat quickly and evenly. According to the manufacturer, a saving of 1 percent in fuel will result from each 11 deg increase in feedwater temperature by the use of exhaust steam. Water storage space provided in the unit is designed to eliminate the necessity for a sump or hot well.

Packless Expansion Joints

HPAC 3—Now available from Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville 4, Tenn., is a complete, factory assembled packless expansion joint for absorbing the expansion of hot water heating system lines, service water lines, etc.



A multi-ply bellows, made of monel, provides the packless feature, and all other parts, except bolts, are made of brass. The unit is available in standard pipe sizes from ½ in. to 3 in. inclusive, and is designed for pressures up to 100 psig. Flax packing is used to provide a safety feature and to function only when a leak occurs. The leakage is absorbed by the packing which swells and makes a tight seal. The expansion joint for water lines is designated as No. 111-M. Another type, available for steam lines, is designated as No. 110-M.

Refrigeration Oils

HPAC 4—A new series of refrigeration oils for higher operating temperature air conditioning and refrigeration equipment has been developed by Sun Oil Co., 1608 Walnut St., Philadelphia 3.

According to the company, recent developments in the refrigeration industry have brought about a need for new refrigeration oils because of higher operating temperatures and the increased use of hermetically sealed compressors. These are paraffinic type oils containing an oxidation in-

FOR YOUR CONVENIENCE [3-51]

Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature

(Circle each HPAC number in which you are interested)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23							
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136				

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

hibitor to make them more stable thermally. They are said to be especially fortified to prevent the formation of gums and varnish.

Refrigerant Liquid Level Control

HPAC 5—The new "Select-A-Level" liquid level control of Sporlan Valve Co., 7525 Sussex Ave., St. Louis 17, is an electronic device used to maintain the liquid level of flooded type refrigeration systems using "Freon-12", "Freon-22", or ammonia.

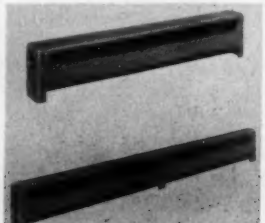
It is designed to actuate a solenoid valve, magnetic contactor or other equipment requiring the opening and closing of an electrical circuit to maintain constant liquid levels. It consists of a control unit connected by a coaxial cable to a sensing element which is a porcelain coated steel rod mounted in a steel tube and which electronically senses any change in its electrical capacity caused by a rise or fall of the refrigerant level. Through the functioning of a vacuum tube, a relay in the control unit actuates a solenoid valve or other equipment.

The sensing element can be installed directly in a refrigerant evaporator-accumulator or pressure vessel, or it may be used in any liquid column where present practice utilizes a mechanical float unit. Liquid levels can be maintained between 0 and 30 in. depending upon the length of sensing element used. The outstanding advantage is said to be the ease of adjustment of liquid level and differential.

Low Level Convectors

HPAC 6—Young Radiator Co., Racine, Wis., has added a new low-level style convector to its line of heating, cooling, and air conditioning equipment. Designed to eliminate picture window drafts, the new FL units are 12 in. high, can be installed beneath the window sill in wall recessed or free standing positions. A variety of lengths (20 in. to 112 in.) and depths (4 in., 6 in., and 8 in.) are available for hot water and two pipe steam systems.

Streamlined cabinets are primed for painting to harmonize with room interiors and have rounded corners and flanged edges. The manufacturer reports that all models are tested and rated in accordance with Commercial Standard CS 140-47, as developed cooperatively by the trade and the National Bureau of Standards.



Low Level Convectors

Condenser

Evaporative Condensers, Cooling Towers

HPAC 7—Designed for outdoor installation only, the new type P evaporative condensers and type PT cooling towers are available from Baltimore Aircoil Co., Inc., 715-17 W. Pratt St., Baltimore 1.

The new and improved line of evaporative condensers replaces the present "CPE" units and is said to be unusually suited for dry operation during the winter. Available sizes are 3, 5, 7½, and 10 tons, and from 10 to 100 tons in 5 ton increments.

The "Mono-Drive" for the fan and pump is standard on all sizes and separate fan and pump drives are available as an extra. Vertical pumps drain automatically when the sump is emptied. Motors are of the ball bearing type with special tropical insulation suitable for outdoor installation. Propeller fans are of the wide blade, slow speed type, and the fan motor and pump bearings are prelubricated for life. Casings and sumps are made of galvanized sheets, and all units are furnished in aluminum lacquer as an additional protection against corrosion. Condensing coils are fabricated of prime surface steel pipe, formed, welded and hot dipped galvanized after fabrication. Condensers are suitable for either "Freon" or ammonia.

The new cooling towers are similar in construction to the evaporative condensers and capacity ranges are the same.

Window Type Room Conditioners

HPAC 8—The 1951 line of room air conditioners of Mitchell Mfg. Co., 2525 N. Clybourn Ave., Chicago, is now in production. In addition to new and improved features on the regular ¾ hp and ½ hp units, the line includes two new units — a 1/3 hp and a 1 hp unit.

All four of the units are of the window type and operate on the company's "Dyna-Cooler" principle, which is said to assure maximum passage of low temperature refrigerant through the cooling system.

Air Pollution Test Unit

HPAC 9—W. B. Connor Engineering Corp., Danbury, Conn., is offering an activated carbon gas and vapor adsorber for determining atmospheric pollution.

According to the company, a common problem in air purification, whether for indoor comfort or outdoor nuisance abatement, is the determination of the prevailing concentration of air-entrained gaseous and vaporous contaminants. Equipment required in order to determine concentration includes a collecting apparatus which will induce a known volume of the contaminated air through a known quantity of granular activated carbon uniformly over a known period of time, together with the facilities for recovering the sorbed impurities so as to relate them in terms of concentration per unit of air from which they were extracted.

The collecting device consists essentially of dual, perforated, activated carbon-filled cannisters assembled integrally with a motor driven air blower. According to the company, the device may be used to adsorb petroleum and hydrocarbon vapors, the odors from decomposition and putrefaction, the so-called aromatics and most of the air contaminating gases incidental to industrial and chemi-

Why heat TONS

OF INSULATION, MOISTURE AND OUTER WALLS DAILY ?

1000 sq. ft. of ordinary insulation when bone dry weigh 2000 lbs.
1000 sq. ft. multiple accordion aluminum weigh 46 lbs.; 1 sheet, 12 lbs.
1000 sq. ft. of ordinary insulation occupy 175 cu. ft.
1000' accordion multiple aluminum occupy 1½ cu. ft.

3000 sq. ft. of ordinary mass insulation means about 3 tons of it to heat every winter morning. If moist and heavy with condensation, there is that much more tonnage to heat, plus the fuel required to evaporate it. (It takes 1,060 Btu's at 60° F to convert 1 lb. of WATER into vapor. Only half that amount, or 530 Btu's, is needed to raise 1500 cu. ft. of AIR 20°.) In addition, ordinary insulations transmit heat to outer walls by direct conduction through solids.

Most building materials, including mass insulations if air-spaced to reduce direct conduction through solids, ABSORB over 90% radiant heat on one surface, and emit 90% on the other surface. *Multiple sheets of accordion aluminum THROW BACK the heat inside the building in winter, outside in summer.* (They REFLECT 97% of heat rays, emit but 3% on the opposite side, block convection; and allow but 5% heat loss by conduction through their air spaces which have negligible density.)

NO CONDENSATION CAN FORM

In winter (with multiple accordion aluminum sheets) there is little heat loss or expense in heating 3000 sq. ft. of the one aluminum sheet in contact with the warm air. It weighs less than 40 lbs. (1/100 lb. per sq. ft.), immediately assumes almost the same temperature as the contiguous warm air, and so is *non-condensation forming.* Its zero permeability prevents any passage of vapor.

The outer aluminum, which also weighs less than 1/100 lb. per sq. ft., is about the same temperature as the contiguous cold air, (slightly warmer in fact) and so is *also non-condensation forming.* Since heat flow in conduction and radiation is from warm to cold, no heat is extracted from the air (the reverse in fact). Therefore the capacity of the air to retain vapor without condensing is not reduced (in fact, increased).

THERE IS NO DEW-POINT

Between the 2 external aluminum sheets are 4 protective, reflective air spaces; *without a dew-point* anywhere on or within the insulation.

The commercial form of multiple sheets of accordion aluminum is Infra Insulation Type 6. For additional information about heat and vapor, consult the U. S. Government booklet *"Insulation and Weatherproofing,"* or Infra's *"Simplified Physics of Vapor and Thermal Insulation."* Either or both sent free by Infra. Use the coupon.

THERMAL FACTORS, TYPE 6

Down-Heat C.044 R22.72 equals 7½" DRY Rockwool
Up-Heat C.08 R12.50 equals 4" DRY Rockwool
Wall-Heat C.073 R13.69 equals 4½" DRY Rockwool

VAPOR PERMEABILITY equals ZERO

INFRA INSULATION, INC.
10 Murray Street New York, N. Y.
Telephone: COrtlandt 7-3833

INFRA INSULATION, INC. DEPT. H-3
10 Murray Street, New York, N. Y.

Please send FREE:
"Insulation and Weatherproofing." ☐;
"Simplified Physics of Vapor and Thermal Insulation ☐;
Price Lists ☐; Free Samples ☐.

Name_____
Firm_____
Address_____

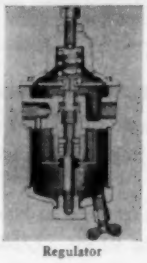
cal processes. After use, the cannisters are separated from the unit, sealed and returned to the laboratory for reactivation, i.e., the extraction of adsorbed impurities. Analyses may be simply quantitative or both quantitative and qualitative, depending on the purpose for which the determination is made.

Combination Regulator and Filter

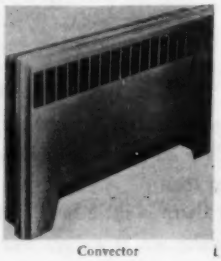
HPAC 10—The "Cono Airpack", a development of Conoflow Corp., 2100 Arch St., Philadelphia 3, is a combination regulator, filter and dripwell.

Constructed of brass and stainless steel, it is designed to provide maximum resistance to corrosive atmospheres and to have a capacity of approximately 25 cfm. The filter medium is phenolic resin-impregnated cellulose said to be capable of removing oil and water and particles down to 40 microns in size.

Offered in pressure ranges of 0 to 25, 0 to 50, and 0 to 125 psig, the device is said to be an ideal unit for equipment using air, such as gaging equipment, air brushes, paint spray machines, laboratory equipment, automatic control instruments, etc.



Regulator



Convector

Recessed Convector

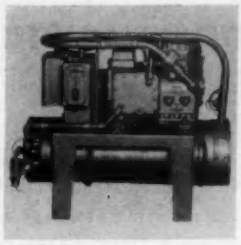
HPAC 11—A new "Brown Heet" recessed convector unit, designed to provide high heating efficiency and to harmonize with room interiors, is available from Brown Products Co., Forest Hills, N. Y.

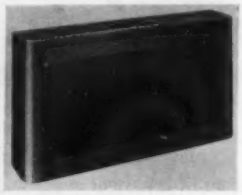
Heating elements consists of $\frac{5}{8}$ in. diameter seamless copper tubing mechanically expanded into aluminum fins. The coils are headered with $1\frac{3}{8}$ in. diameter copper headers, all joints and connections being copper welded. The supports for the heating elements are so designed that elements can be pitched in either direction or turned end for end to suit piping connections.

Liquid Chillers for Air Conditioning

HPAC 12—The "Flow-Cold" liquid chillers of Acme Industries, Inc., Jackson, Mich., are offered in six models ranging from 2 to 15 hp and are used for numerous commercial and industrial liquid chilling applications. A more recent application stressed by the company is in connection with air conditioning offices, surgical rooms, motels and tourist courts, fitting rooms, stores, hotel suites, beauty parlors, barber shops, etc.

These self contained units are designed to pass through average doorways and may be remotely located in any convenient location. They can be used with forced warm air heating systems by installing one of the company's cooling coils in existing air ducts or directly in the furnace. They may also be used with hot water or steam heating systems by circulating chilled water through forced air convector-radiators.





Air Conditioning Unit

Left: Liquid Chiller

Air Conditioning Fan Window Units

HPAC 13—The latest development of York Corp., York, Pa., in air conditioning equipment for multi-story, multi-room buildings was exhibited at the 10th International Heating, Ventilating & Air Conditioning Exposition.

Designed to conserve space and thus meet the physical limitations imposed by modern architectural design, the new fan window units require only three pipe connections — water supply and return, and drain piping.

Units are designed so that the quantity of filtered outside air introduced into the conditioned spaces may be varied from 0 to 100 percent. Advantages stressed by the company include the relatively small building space required, not only in conditioned areas but also in engine rooms where space must be provided for only a central water cooling unit. The system is said to be ideally suited to buildings in which work can be continued in some sections after the main working force has gone home. Units may be installed initially for heating and ventilating only, and complete air conditioning may be provided at a later date. To do this, it is only necessary to add a central chilled water system.

Load Center With Panelboard Features

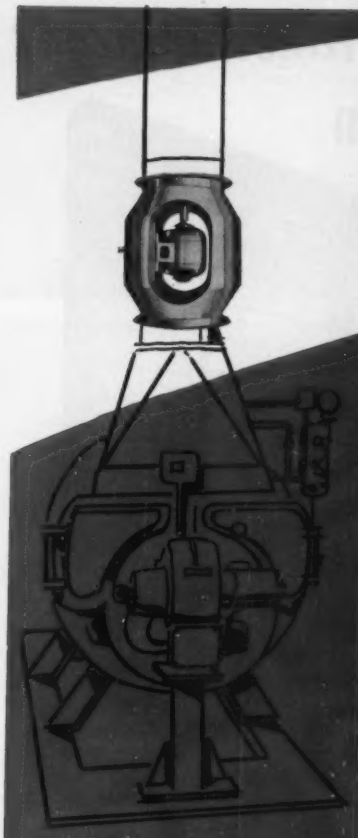
HPAC 14—Trumbull Electric Mfg. Co., Plainville, Conn., describes its new line of load centers (40 to 100 amp) as having many features formerly obtainable only in more expensive industrial panelboards. These include the TQL breaker — a plug-in, quick-make, quick-break breaker with thermal-magnetic protection.

Recommended for commercial applications, units are furnished in six sizes to accommodate 1 to 20 circuits. Breakers of all sizes from 15 to 50 amp are physically interchangeable in the load centers, and 12 through 20-circuit load centers permit sequence phasing — that is, adjacent breakers on alternate phases so the loads can be balanced.

Corrosion Resistant Heat Exchanger

HPAC 15—In the "Econalloy" heat exchanger of Martin-Quaid Co., 1802 Sedgley Ave., Philadelphia 32, corrosion resistant materials are used as flange inserts and for the inner tube which contacts the fluid or vapor being heated. The alloy inner tube is expanded into prepared

[*Continued on page* 220]



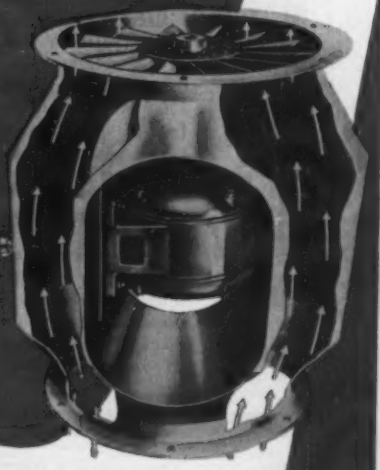
SOLVE DIFFICULT STACK PROBLEMS ECONOMICALLY WITH

DEBOTHEZAT *Induced Draft* BIFURCATOR FANS

There's no guesswork when DeBothezat trained engineers recommend the right Induced Draft Bifurcator Fan for your particular boiler. DeBothezat fan selection is based on more than merely boiler HP or pounds of fuel fired per hour. In addition to this, consideration is given to specific temperatures, the resistance of each boiler to air-flow and other confidential data furnished on each make and size of boiler by the manufacturer. With DeBothezat, you're always sure of the correct size fan unit for maximum efficiency.

HOW THE BIFURCATOR WORKS

The DeBothezat Bifurcator is a direct motor-driven fan with a divided housing, easily installed in a vertical stack or horizontal or angular breeching. Gases are by-passed around the motor, which remains cool, clean and easily accessible. No special platforms or supports are required. Standard fan sizes 12" through 36", for boilers having nominal ratings up to 400 BoHP, or 56,000 EDR.



SEND FOR FREE BULLETIN

Descriptive illustrated bulletin, containing diagram and specifications for suggested installation is yours without obligation. Address Dept. H-251.

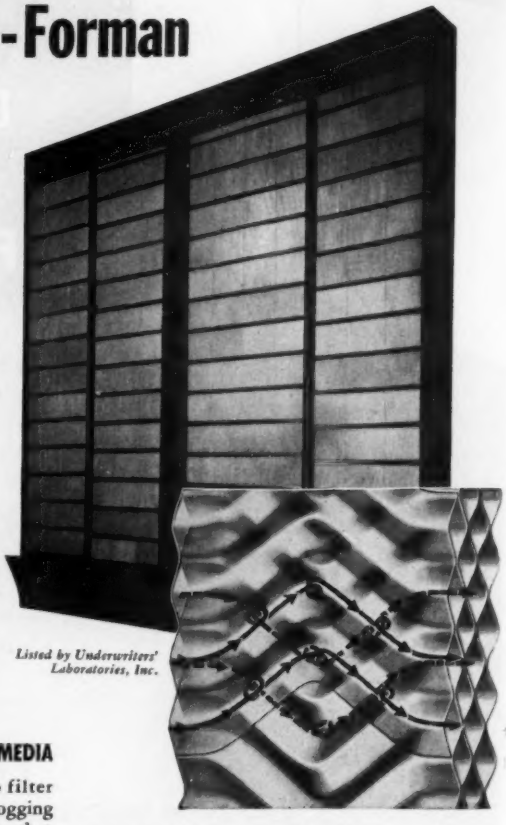
DEBOTHEZAT FANS DIVISION

American Machine and Metals, Inc., East Moline, Illinois

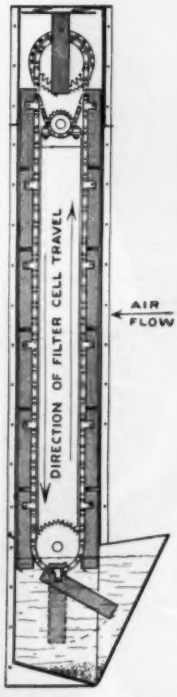
CONTINENTAL *specified...4 times straight by expanding* Brown-Forman

PLEASED by the performance of its first two *Continental* Automatic Air Filter installations in its air-conditioned administration building, Brown-Forman Distillers Corporation promptly ordered *Continental* again last year when building its new headline-making bottling plant.

Now, for the fourth time, in the administration building annex just completed, Brown-Forman again specified *Continental*. Here are the principal reasons:



Listed by Underwriters' Laboratories, Inc.



REVOLUTIONARY NEW FILTER MEDIA

Skillfully engineered honeycomb filter media (patented) has large non-clogging air passages, yet extracts air-borne dust thoroughly by splitting the airflow into 2300 separate whirling streams per square foot of filter surface. Thus it combines higher efficiency with *constant* low resistance to air flow.

FERRIS WHEEL ROTATING ACTION

Filter cells pivot like cars on a ferris wheel as they pass from the front to the back filter curtain. There is no reversal in the direction of air flow through the filter media. As a result, *dirt cannot be blown off into the clean-air stream.*

POSITIVE SELF-CLEANING ACTION

As each filter cell moves down into the oil reservoir, it soaks in a semi-horizontal position for 30 minutes or more. The cell then automatically drops to a vertical position. This patented action forces a surge of oil through the filter which effectively flushes out accumulated dust and thus *preserves the low initial resistance of the filter.*

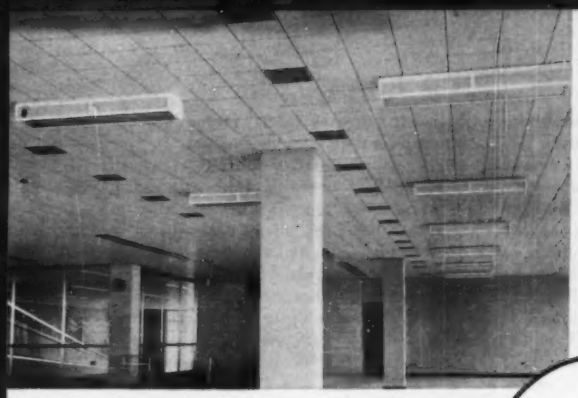
WRITE FOR PERFORMANCE DETAILS

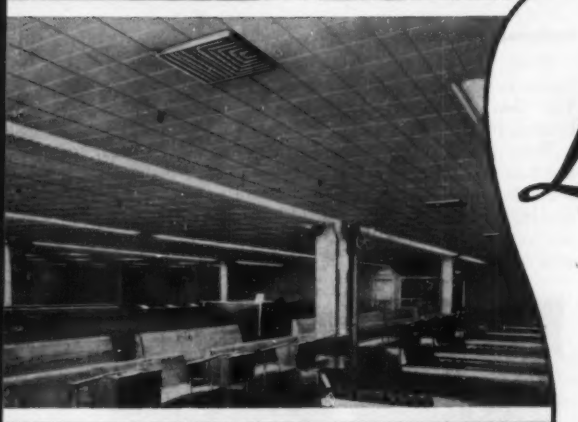
Before you specify or buy, ask us for complete data on this Continental Automatic Self-Cleaning Air Filter.

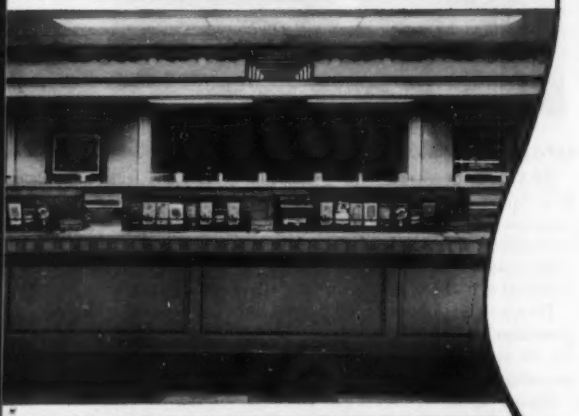
USE THE COUPON

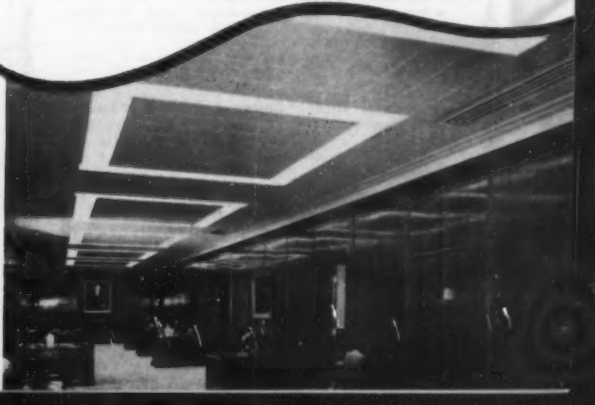
GENTLEMEN: Please send the following:
Bulletin No. 201-C ☐ Sample of Ezwash Air Filter Media ☐
NAME _____
FIRM _____
STREET _____
CITY _____ STATE _____

CONTINENTAL AIR FILTERS, Inc.
P. O. BOX 1647 • LOUISVILLE 1, KY.









Look Around...

You'll Find AGITAIR® Everywhere

The Only Air Diffuser Tailor-Made for Each Application

In buildings . . . plants . . . stores . . . offices . . . restaurants . . . banks . . . hospitals . . . hotels — you'll find AGITAIR Type R diffusers, with patented built-in diffusing vanes, providing correct air distribution . . . noiselessly, draftlessly. Only AGITAIR Type R diffusers may be assembled in a variety of patterns to provide blows in one — two — three and four directions, proportional to the area being served. Result: 100% air distribution in any shape area, from any location.

Write for Complete Data

AIR DEVICES Inc.

17 East 42nd Street, New York 17, N. Y.

Air Diffusers • Air Filters • Roof Exhausters

Mueller Climatrol Gas Boilers Must be Good!

They're Triple Tested

Type 20 Gas Boiler — from 315,000 to 3,780,000 Btu for steam and hot water.

to assure continued, trouble-free performance

Yes, every Mueller Climatrol boiler is hydrostatically *tested three times* before shipment—at three separate stages of manufacturing. When these boilers leave the factory, they are right! No wonder Mueller Climatrol Boiler installations are renowned for trouble-free operation and long life.

Mueller's sectional design gives you close-to-size capacities for any job; check these advantages:

- Wide range of residential and commercial sizes — from 54,000 to 3,780,000 Btu input.
- Cast iron, sectional. Precision-machined gas-tight flue passages. Maximum heat transfer.
- Patented V-venturi; cast-iron burners; easily accessible.
- Modern, attractive styling. Easily cleaned through access panel without removing casing.
- American Gas Association approved; conform to ASME Code. Backed by 26 years gas boiler manufacturing experience.

Choose Mueller Climatrol gas boilers for all your steam or hot water heating or hot water supply jobs — it really pays. Write for complete details. *L. J. Mueller Furnace Company, 2023A W. Oklahoma Avenue, Milwaukee 15, Wisconsin.*

94th Anniversary **Mueller Climatrol**

[*Continued from page 216*]

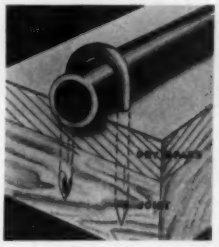
serrations in the insert flange by special torque limit controls designed to prevent undesirable stresses.

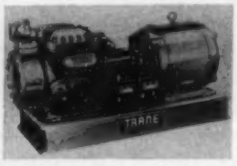
According to the manufacturer, these heat exchangers also provide uniform heat over the full surface from flange to flange without dead spots. They are also said to save space because they form an integral part of the piping system, and can be supported vertically or horizontally along a wall or on hangers. Sizes range from a fraction of a square foot of heating surface to several hundred square feet in lengths up to 30 ft per segment. Tube sizes range from ¼ to 4 in., and standard units are available for pressures up to 900 psi, and temperatures in excess of 700 F.

Fasteners for Copper and Brass Tubing

HPAC 16—Two new, extra long staples for fastening copper and brass tubing have been added to the "Tube-Tite" line manufactured by E. H. Tichener & Co., Binghamton, N. Y.

These staples are designed for fastening tubing when dry board or plaster must be penetrated before the staple comes in contact with the joists. The new sizes accommodate ⅜ in. and ½ in. nominal tubing. They are round top, round wire staples made from copper with a steel core for strength.





Refrigeration Compressor

Left: Tubing Fastener

Refrigeration Compressors

HPAC 17—According to The Trane Co., La Crosse, Wis., quiet vibration-free operation, low operating and maintenance costs, and long-wearing surfaces are incorporated in the design of the new line of reciprocating compressors which were introduced at the recent 10th International Heating & Ventilating Exposition.

Designed for comfort and process air conditioning applications, the new compressors are built in 10, 15, 20, 25, 40 and 50 ton capacities. Complete condensing units are also made in each size.

According to the manufacturer, the new compressors do not require special foundations, floor construction or soundproofing. The noise level is said to be below that of the average office, noise being reduced through the use of plastic cushion valves, aerodynamically designed suction and discharge gas passages, and location of all parts of the capacity control system within the cylindrical body. Other features are said to include low power consumption (resulting from high volumetric efficiency), automatic, internal multi-step capacity control, "unloaded" starting, and a force-feed lubricating system in which oil is filtered twice before reaching bearing surfaces.

Units are designed for operation with "Freon-12" refrigerant.

"You Build for your own and your country's future when you save..."

BENJAMIN F. FAIRLESS

President, U. S. Steel Corporation

"A free economy, such as ours, is built on the savings of the people. And the future security of America depends on the initiative and the growth of every citizen. We in U. S. Steel encourage our employees to join the Payroll Savings Plan, and we are proud that the National Tube Company, one of our subsidiaries, was the first of the large industrial companies of the nation in 1950 to have more than 80% of its employees participating. Remember, you build for your own and your country's future when you save."

Mr. Fairless is not expressing a personal opinion, nor is he speaking for other far-seeing executives when he tells you that our economy is built on the savings of the people and a man builds for his own and his country's future when he saves.

Actually, Mr. Fairless is merely putting in words the thoughts and action of the millions of employed men and women who *now hold* more than 50 billion dollars in U.S. Savings Bonds.

$50,000,000,000! Who *sold* all those bonds to millions of people? The answer is, nobody sold them.

80% of the employees of the National Tube Company ... 75% of the employees of Carnegie-Illinois Steel Company ... thousands of employees of other U.S. Steel subsidiaries ... more than 8 million employees of other companies bought U.S. Savings Bonds and are buying them every month on the easy, automatic Payroll Savings Plan. Their employers merely offered these men and women an opportunity to save for their future. There was no pressure, no emotional appeal.

How does employee participation in *your* Payroll Savings Plan match up with the 80% of National Tube, the 75% of Carnegie-Illinois? Or, perhaps you are one of the relatively few large companies that do not have a Plan? In either case, wire or write, Savings Bond Division, U.S. Treasury Department, Suite 700, Washington Bldg., Washington, D.C. Your State Director is ready to help you with a package plan—application blanks, promotional material, practical suggestions and all the personal assistance you may desire.

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the G. M. Basford Company and

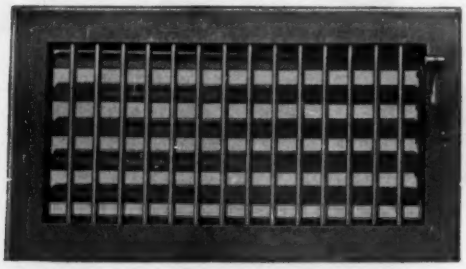
Heating, Piping and Air Conditioning

"Streamliner" Meet the AUER

— A New Kind of

High Velocity REGISTER

Better Designed and Built! Longer Lasting!



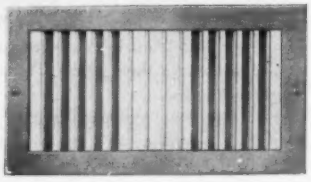
No. 1005V-HML. Single bank of adjustable bars, multi-louvre valve.

Full flexibility for multiple deflection is furnished by these Streamliner registers and grilles. They provide correct diffusion for high velocity outlets in air conditioning, ventilating or cooling systems.

Bars are hollow moulded, beveled, perfectly formed, and smooth in contour. They are pivoted in the frame on special split sleeves, or expansion inserts, which furnish proper tension to hold bars firmly when set, yet allow easy adjustment to the desired angle with one simple tool. Bars are slightly "tear-drop" shaped like an airplane wing in cross-section, and pivoted at the exact center, so they can be turned completely around. Some users prefer to turn the thin edge outward for outlets (and the broader edge toward the flow of air) cutting resistance and turbulence to a minimum. Bars may be set at any angle, in any grouping. Shutters of multi-louvre valves are pivoted on rivets to prevent vibration. All Streamliner registers are equipped with gaskets. Write for Folder S-49 with sizes and list prices.

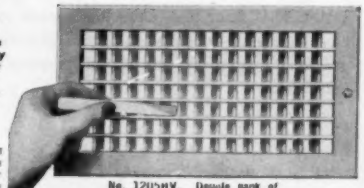
8 MODELS

The Series includes models with single bank of adjustable bars (vertical or horizontal), also with double bank of adjustable bars (vertical in front and horizontal in back, or the reverse), also all above four types with the addition of horizontal multi-louvre valves in the rear, controlled by lever on face of register.



No. 1005V. Single bank of adjustable bars, no valve.

Cross section of bar. Bars are absolutely quiet at high velocity.



No. 1205HV. Double bank of adjustable bars, no valve.

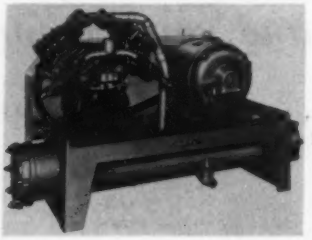
Complete Auer Register Book—or Catalog "G" or perforated grilles—sent on request.

The Auer Register Co., 6600 Clement Ave., Cleveland 5, Ohio

Auer REGISTERS & GRILLES for AIR CONDITIONING & GRAVITY

Packaged Conditioners, Compressors

HPAC 18—Three new self contained air conditioning units of Curtis Refrigerating Machine Div., Curtis Mfg. Co., 1905 Kienlen Ave., St. Louis 20, were displayed for the first time at the recent 10th International Heating, Ventilating & Air Conditioning Exposition. These units complete the company's line from 2 to 15 tons, the line now consisting of 2, 3, 5 and 7½ ton units, together with 10 and 15 ton central type conditioners.



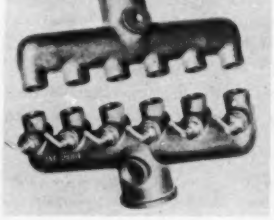
New 20 through 40 hp refrigeration compressors were also on display. These units can be equipped with automatic capacity reduction and have full pressure lubrication on all bearings. They can be supplied as compressor units, or can be combined with a variety of cleanable shell and tube condensers.

Also shown were several units of a new line of combination air and water cooled condensing units from ½ through 3 hp.

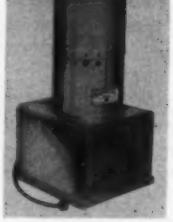
Manifold and Return Header

HPAC 19**—H & G Plumbing Products, Inc., 6 Ohio Ave., Port Washington, N. Y., has introduced an improved "Balance-Flo" manifold (with a new type of "finger-tip" adjustment) and a return header.

The two units are recommended for use in connection with radiant panel and hot water heating systems. They are said to provide zone control and to eliminate the need for extra valves, joints and fittings. Made of one piece cast bronze, the bodies are furnished with either a ½ or ⅜ in. outlet. The manifold has a "tamperproof" butterfly valve on each outlet. Furnished with copper sweat fittings or iron pipe size threads, the manifolds and headers are available with four to eight outlets.



Manifold and Return Header



Dehumidifier

Small Industrial Dehumidifier

HPAC 20—Walter Haertel Co., 2840 Fourth Ave., S., Minneapolis, is offering a new "junior" commercial and industrial dehumidifier, No. 50.

Remember—

the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Bring on your severe conditions—

YOUR FIRST CHOICE for *severe service* conditions in piping is the TUBE-TURN Welding Neck Flange. It is engineered with a long tapered hub and a smooth transition in thickness to the pipe-end bevel. This means greater pressure-containing capacity under extreme temperature as well as much longer life than other types when repeated pipe bending or severe vibrations are involved.

For other jobs choose from these TUBE-TURN Welding Flanges: slip-on flanges; lap-joint flanges; socket-welding flanges; blind flanges; orifice flanges; pipeline non-standard flanges. Get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Write Dept. A-3 for free booklet, "Research on the Cyclic Life of Piping Systems."

"Be sure you see the double tt"

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles

TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO . . . A wholly owned subsidiary of TUBE TURNS, INC.

Welded wrought-iron lines serve new Hospital Buildings

Underground tunnels at Cleveland's City Hospital contain the old and the new in piping. New 125-pound steam main (Fig. 1) serving several new buildings is welded. A welded system with TUBE-TURN Fittings was chosen to cut installation time, and to get tight, leakproof joints.

New welded line (Fig. 2) elbows neatly over an older pipe. When space is confined like this, welding is the answer. Contractor welded pipe from 2" up to 12" in tunnels, boiler room and power house.

With welding equipment on the job it's easier to put up pipe supports too. Eyebolt (Fig. 3) is quickly welded to TUBE-TURN Elbow, support rod hooked through it. This steam line to the water heaters must be secure.

Insulation on the maze of piping to the boiler feed pumps (Fig. 4) went up fast, with no flanges to work around. In such close quarters a neat design and reduced space requirements are especially important. And with the pipe welded to TUBE-TURN Fittings, joints won't leak, and insulation will last.

DISTRICT OFFICES
New York
Philadelphia
Pittsburgh
Chicago
Houston
Tulsa
San Francisco
Los Angeles

TUBE TURNS, INC.
LOUISVILLE, KENTUCKY

Fig. 1. Welded underground steam main.

Fig. 2. New welded piping fits in small space.

Fig. 3. Support on steam line elbow.

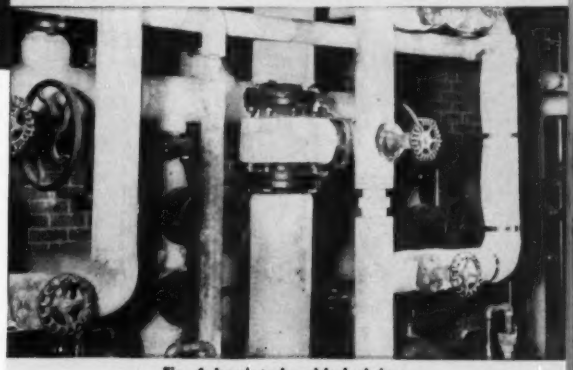


Fig. 4. Insulated welded piping.

TUBE TURNS, INC., Dept. A-3
224 East Broadway • Louisville 1, Kentucky

Your Name .....
Position .....
Company .....
Nature of Business .....
Address .....
City ..... *State* .....

Powered with a ½ hp hermetically sealed "Freon" condensing unit, it has a maximum 24 hr capacity of 50 lb of water removal from the air. It is said to remove 1 gal of water from the air in storerooms or other closed spaces in from 4 to 5 hr under average temperature and relative humidity conditions. According to the manufacturer, it is expected to find wide use in such applications as hotels, where its portability and capacity will often permit rooms to be returned to revenue-producing service soon after redecoration.

An optional automatic means of disposing of the condensate removed from the air makes it unnecessary to "carry the pail".

Vacuum Gage

HPAC 21—The recently announced direct reading vacuum gage of Hastings Instrument Co., Inc., Hampton, Va., is an electrical indicator for measuring absolute pressures from 0 to 1000 microns of mercury and is designed to give response in less than ½ sec.

It is recommended for laboratory or production instrumentation and features noble metal thermopile and nickel plated pickup tubes, the latter being said to afford freedom from outgassing, system contamination, and corrosion.

With the switching attachment illustrated, five stations per standard selector unit may be connected to each indicator. Matched gage tubes eliminate the need for additional adjustment when switching. According to the manufacturer, calibration of the gage tube is not affected by exposure to atmospheric pressure or changes in ambient temperature and there is no need to reset the current each time the pressure changes. The unit is said to be ideal for leak detection warning work or pressure operated control systems.

Vacuum Gage

Fire Detector

Fire Detector

HPAC 22**—The FD-10 photoelectric fire protection system of Fireye Corp., 77 Broadway, Cambridge 42, Mass., is designed to provide protection throughout a room or fire zone by "seeing" a small fire. It is said to be unaffected by extraneous light of any intensity.

The unit consists of six detectors and one control panel, and provides coverage up to 120 × 80 ft. For areas larger than this, combinations of protection blocks may be used. A self-monitoring feature incorporates an electrical impulse (of sufficiently low intensity to prevent a fire alarm indication) continuously applied through all circuits. The loss of this signal from any wiring or component failure actuates a relay so as to provide a warning.

The system is recommended for use in industrial areas, in air conditioning duct systems, or on board ship.

Save water! Save space! Save installation time and money! Save operating costs! Yes, install Governair and *save from $50 to $200 for each ton* of the completely packaged Governair unit designed to fit your needs!

Experience proves Governair can save you up to $5,000 on a 50-ton Governair unit that gives greater dependability and more "engineered efficiency" than ever before!

If you want the best — if you want the most economical and reliable air-conditioning unit on the market . . . CHOOSE GOVERNAIR and SAVE!

AIR CONDITIONERS

EVAPORATIVE CONDENSERS

BLAST COILS FOR HEATING & COOLING

ORIGINATORS OF COMPLETELY PACKAGED AIR CONDITIONERS

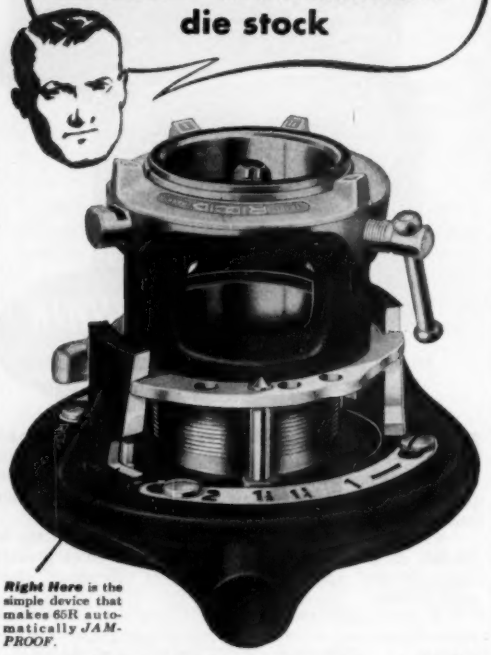
GOVERNAIR

UNIT COOLERS

GOVERNAIR CORPORATION • 513 N. BLACKWELDER • OKLA. CITY

You can't jam the new RIDGID 65R

Really streamlined pipe threading with this RIDGID self-contained die stock



Right Here **is the simple device that makes 65R automatically *JAM-PROOF*.**

● You don't have to watch it—lead screw can't jam on workholder. New jam-proof drive plate automatically kicks out driving ratchet pawl when standard length thread is cut. Your recent model 65R easily converted—just buy new drive plate, put in place of old plate. Perfect threads on 1" to 2" pipe with one set of 4 high-speed steel dies—sets to pipe size in 10 seconds, mistake-proof self-centering workholder sets instantly! Buy the new jam-proof RIDGID 65R at your Supply House.

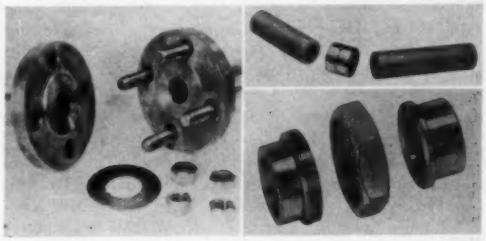
RIDGID

★ Work-Saver Pipe Tools ★

Corrosion Resistant Fittings

HPAC 23**—The new "Speedline" corrosion resistant fittings are available from Horace T. Potts Co., Erie Ave. & D St., Philadelphia 34.

The insert flange, shown at the left in the illustration, is said to combine strength at the connection and corrosion resistance throughout the internal area. It consists of a corrosion resistant, serrated insert in a carbon steel flange. According to the manufacturer, the assembly does not have to be heat treated and pipe cutting to exact length is simplified as the thickness of a gasket is the only allowance which must be made. Sizes available include standard tubing diameters and gages, and nominal pipe sizes from ½ to 6 in.



The new aligning connector (upper right in the illustration) is used for connecting light wall to heavy wall or light wall to light wall piping. It is made in pipe sizes and tubing diameter sizes from ½ in. through 4 in. Methods of joining include soft soldering, silver brazing and socket welding. In the illustration, it is used for connecting Schedule 40S pipe and light wall Schedule 5S pipe.

The new tube and pipe union, shown at the lower right in the illustration, is said to combine the best features of the screwed pipe union and the sanitary tube union. The hex nut is made of carbon steel or monel, while parts coming in contact with corrodents are made of metals "best suited to the particular applications". According to the company, the union permits the use of light walled piping systems to handle pressures for which the tubing or pipe is designed. The union is made for ½ in. through 4 in. applications.

These fittings, as well as specially designed connections for tees, crosses, elbows, etc., are stocked in standard analyses of stainless steel and Carpenter Stainless No. 20.

WE HEAR THAT . . .

ALTON F. DAVIS, vice president and advertising director of *LINCOLN ELECTRIC CO.*, Cleveland, has been named industrial advertising's man-of-the-year for 1950 in an annual competition conducted by the magazine Industrial Marketing. The competition, conducted since 1940, is for the purpose of recognizing outstanding advertising published by industry. More than 30 business and technical publications — among them HPAC — carried the award winning advertising.

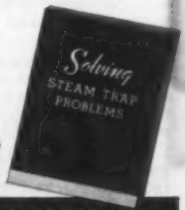
EHRET MAGNESIA MFG. CO. has completed a new plant on the company's present site at Valley Forge, Pa. Operating under a revised processing procedure, the plant is manufacturing an improved 85 percent magnesia insulation in both pipe covering and block form.....Short-

free swinging buckets, like free swinging boxers, GET INTO TROUBLE!

BOXERS who stage a free swinging exhibition in the ring usually run into a lot of trouble in a hurry! Steam traps with free swinging buckets also run into trouble sooner or later. Uncontrolled bucket action inevitably causes bucket damage and leads to high replacement costs. SUPER-SILVERTOP Steam Trap is the only steam trap with a patented *guided bucket*. A guided tube positively controls the bucket, eliminating the possibility of bucket swing. In addition, the exclusive SUPER-SILVERTOP bucket lever assures positive seating . . . preventing costly leakage of live steam. SUPER-SILVERTOPS are the only advanced engineered trap on the market. They require little maintenance, can be installed straight in line or as an elbow, and can be serviced without disturbing a single fitting. Many manufacturers are changing their entire steam trap systems over to SUPER-SILVERTOPS and amortizing the cost with the savings in a remarkably short time. It will pay you to do the same. Talk it over with your nearest SUPER-SILVERTOP representative or write us direct.

* * *

This 36-Page book contains complete data on the selection and installation of steam traps for all services. Mail coupon for your copy today.



THE V. D. ANDERSON COMPANY • 1949 W. 96th St. • Cleveland 2, Ohio

SUPER-SILVERTOP STEAM TRAPS Save Money

THIS BOOK SOLVES STEAM TRAP PROBLEMS

Gentlemen: Please send without obligation "Solving Steam Trap Problems."

Name .....

Address .....

City .....

In Canada: Bawden Machine Co., Toronto

New A-C voltage-sensitive relay makes ideal safety device

Bulletin 401 describes how voltage differential between pick-up and drop-out can be set at 10% (5% on special order)—without chattering—on Ward Leonard's new a-c magnetic relay.

Designed for safeguarding single phase a-c motors (such as on washing machines, oil burners, etc.) against burn-out caused by low voltage, the 401 relay is also ideal for a-c lighting and power bus transfer, voltage regulating, etc.

A small saturable reactor, connected in series with the relay coil, acts as a variable impedance, varying with voltage drop. Since it is the major impedance in the circuit, wide current variations through the coil can be obtained with small line voltage variations.

Being a power-type relay, it provides good contact, good make-and-break. Write for Bulletin 401. WARD LEONARD ELECTRIC CO., 24 South Street, Mount Vernon, N. Y. Offices in principal cities of U. S. and Canada.

WARD LEONARD ELECTRIC COMPANY

Result-Engineered Controls Since 1892

RESISTORS • RHEOSTATS • RELAYS • CONTROL DEVICES

ages of critical materials have caused *CARRIER CORP.*, Syracuse, to discontinue the sale of food freezers to its distributors and dealers. The critical materials will be utilized in the production of air conditioning equipment.

Last year marked the production of the millionth booster pump by *BELL & GOSSETT CO.*, Morton Grove, Ill. Commemorating the event, a gold-plated model was recently presented to *E. J. GOSSETT*, president, by *C. E. PULLUM*, vice president in charge of production..... *KAYLO DIV., OWENS-ILLINOIS GLASS CO.*, Toledo, has begun a program to double its production of hydrous calcium silicate building and insulating products at one plant and to modernize manufacturing techniques at another.

A profit-sharing system that has stood the test of time is the one inaugurated in 1907 by *ILG ELECTRIC VENTILATING CO.*, Chicago. The system is remarkable not only because it has worked satisfactorily over the years but because it was established almost at the time the company was organized.

DEAN L. E. SEELEY, of the College of Technology, University of New Hampshire, and newly elected president of the American Society of Heating and Ventilating Engineers, has been consulting engineer for *H. B. SMITH CO., INC.*, Westfield, Mass., for the last 25 years. He was recently elected to the company's board of directors. *STANLEY K. SMITH*, president of the firm, has been elected chairman of the *INSTITUTE OF BOILER & RADIATOR MANUFACTURERS.*

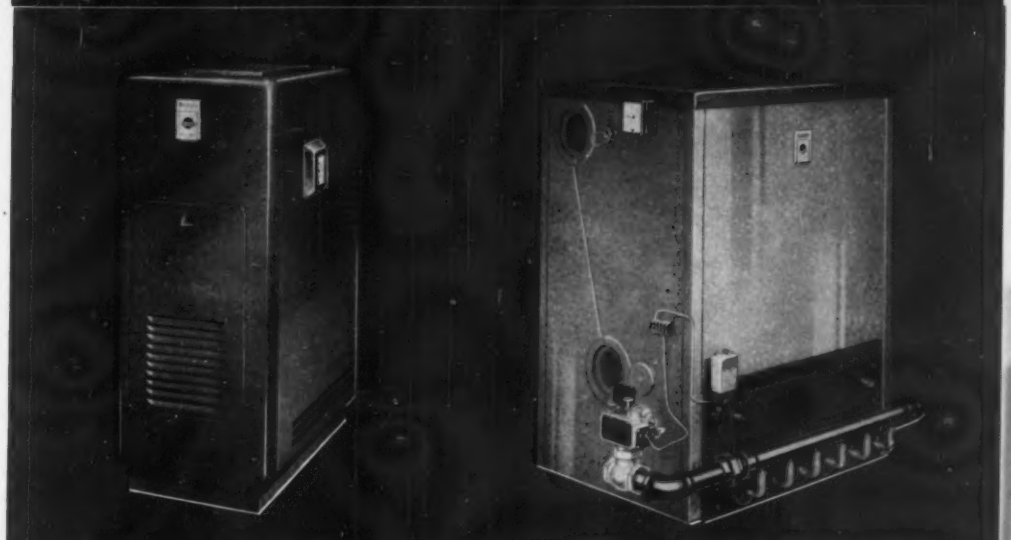
This year, many companies and communities will join with *REVERE COPPER & BRASS, INC.*, New York, in a celebration of the founding of the copper fabricating industry in the United States by Paul Revere in 1801. The company which he founded continued in business until 1928, when it was one of six copper and brass fabricators to join in the Revere Copper and Brass, Inc., merger. The Revere family retired from active management, but *E. H. R. REVERE*, a direct descendant of Paul Revere, has remained a director of the present Revere concern.

ALUMINUM CO. OF AMERICA, Pittsburgh, is building a new alumina plant near Bauxite, Ark. Designed to process low grade bauxite ore, the plant will increase by nearly 50 percent the amount of alumina now being produced by the company.....Arrangements have been completed by *OWENS-CORNING FIBERGLAS CORP.*, Toledo, for building a new glass fiber yarn manufacturing plant in Anderson, S. C. Production will begin about the middle of the year.

District representatives of *AIRTEMP DIV., CHRYSLER CORP.*, Dayton, Ohio, recently held a three day business conference with factory executives. The sales program for this year was outlined and new products were announced.....Eight women and 59 men whose continous service totals 1951 years were recently honored by *BROWN INSTRUMENTS DIV., MINNEAPOLIS-HONEYWELL REGULATOR CO.*, Philadelphia. These employees held the first annual dinner and reception of the company's newly organized Quarter Century Club.

AMERICAN-Standard

First in heating . . . first in plumbing



The EMPIRE and the STANDARD

engineered to supply economical, automatic heat for homes of all sizes

No matter what the size of building to be heated, one of these gas fired boilers—the Empire or the Standard—from the American-Standard line can handle the job. Both of these outstanding units have been so designed and coordinated by our engineers that they offer maximum heat output under all conditions.

The **EMPIRE** Gas Boiler is one of the most striking gas fired boilers on the market. Its colorful jacket is the smart American-Standard Forge Red which catches the interest of all who see it on your sales floor . . . and its compact design makes it an attractive installation in any basement. The boiler is constructed of durable cast iron and is equipped with precise, dependable controls to assure lowest operating and maintenance cost compatible with ample comfort. Important among these controls is the Automatic Gas Valve, operated by the thermostat to maintain desired room temperatures effortlessly and economically. To increase the unit's efficiency still further there is a thick layer of insulation under the trim jacket, which prevents excessive heat loss into basement and reduces operating cost. The Empire comes in models for basement or first floor installation.

The **STANDARD** Gas Boiler has the same design features and precision controls as the Empire, but is supplied—at a somewhat lower cost—with a jacket which does not conceal all controls. It can be used to heat homes, and is also available in larger units for installation singly or in battery in all types of buildings.

These boilers and other American-Standard products are sold through selected Wholesale Distributors to Heating and Plumbing Contractors.

American Radiator & Standard Sanitary Corp., P. O. Box 1226, Pittsburgh 30, Pa.

LOOK FOR THIS MARK OF MERIT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS · DETROIT LUBRICATOR · KEWANEE BOILERS · ROSS HEATER · TONAWANDA IRON

We doubt that you've worked on many birdhouses lately.

We haven't helped heat any, either.

But we can help heating engineers and contractors provide the proper thermal environment for any client—anywhere—in any kind of structure.

We have a lot of literature on the automatic control of all phases of heating, ventilating and air conditioning. Information you should have in your files.

And we have a lot of very well informed control engineers—in our 89 different offices—who have a lot *more* information right at their finger tips.

We sincerely believe we can help you on any project that poses problems of control of any kind—for *control* is Honeywell's business.

So, why not *talk to Honeywell?* Why not *write* to Honeywell for complete information on the equipment discussed in the column across the page? And why not do it *now?*

MINNEAPOLIS
Honeywell
First in Controls

BLACK & DECKER MFG. CO., Towson, Md., has opened a new sales and service branch at 881 W. Delavan Ave., Buffalo, N. Y. The new building increases sales and service facilities nearly 400 percent over the firm's previous Buffalo location.....*A. X. NELSON & CO.* has been appointed by *SURFACE COMBUSTION CORP.*, Toledo, to handle the sales and service of its humidity control equipment in the Minneapolis area.

HAROLD H. LAYRITZ, sales manager, *LUNKENHEIMER CO.*, Cincinnati, received his 30-year service pin at a presentation in conjunction with the company's annual international sales convention held recently. He was one of seven employees honored for continuous service. The convention afforded representatives an opportunity to tour the firm's two giant plants and to inspect the multi-million dollar modernization and retooling program just completed.

GENERAL CONTROLS CO., Glendale, Calif., will build a new factory and warehouse in Skokie, Ill., where a 4½ acre site has been purchased. The plant is being built to better serve midwest and eastern customers. The company has also opened a factory branch sales office at 1035 N. Pennsylvania St., Indianapolis. *RICHARD H. WEBER*, formerly with Engineering & Equipment Co., of Cincinnati, is in charge of the new office.

ACF BRILL CO. has ordered 100 new bus air conditioning units manufactured by *CARRIER CORP.*, Syracuse. The units are of a special type and are said to feature operation of the compressor by direct belt and pulley drive from the main bus engine. The compressor and other parts of the system are made of aluminum wherever possible. The five ton units will be used on new inter-city buses seating 41 people in a single, one level passenger compartment.

As previously announced, *TUBE TURNS, INC.*, Louisville, has named *BETHLEHEM SUPPLY CO. OF CALIFORNIA* and *BETHLEHEM SUPPLY CO.*, Tulsa, Okla., distributors of its welding fittings and flanges. More recently, these two firms have merged and the Los Angeles organization will be operated as an integral unit of the Tulsa firm.

GUY L. WARDEN & SONS, district representatives for Johnson Corp., Three Rivers, Mich., in lower California, are now covering the entire state, as well as the counties of Curry, Josephine and Jackson in Oregon. In addition to its offices in Los Angeles, the west coast firm has opened a new office at 5200 E. 12th St., Oakland, Calif.....*FABER ENGINEERING CORP.*, Philadelphia, has named *BERCHEM CO.*, 50 Church St., New York City, a new sales representative. The New York firm is discontinuing representation of domestic pumps.

KRAMER TRENTON CO. has completed a major expansion and consolidation program. The continual growth of the company resulted in four separate locations in the city of Trenton, N. J. During the past six months operations were consolidated into the Olden Ave. plant

We can't help you heat birdhouses, but we can help you plan better control for your heating systems. So fill out the coupon below and send it to us for

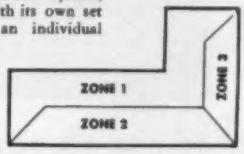
Facts you need—FREE!

Honeywell Electronic Moduflow can give your customers the finest automatic temperature control available. In this system, the smallest change in temperature indoors—or outside the house—activates sensing elements which signal the Electronic Relay Amplifier. The amplifier "interprets" the signals—and controls the heating plant with split-second precision. That's why Honeywell Electronic Moduflow provides the owner with uniform comfort—even in the most changeable weather.

A highly adaptable system, Electronic Moduflow is superior to all other home temperature control systems for these two reasons: *1. All sensing elements are electronic—which means they're up to 100 times more sensitive than mechanical controls. 2. Units of the systems compensate for all three important control factors—temperature changes outdoors, load shifts indoors and structural heat loss.*

Honeywell Zone Control is an excellent way to achieve uniform comfort and economy in *any* type of structure. Tailor-made systems are available for homes—and for institutional, commercial and industrial buildings.

In the Honeywell Zone Control System, each zone is equipped with its own set of controls, including an individual thermostat. This means you can maintain the desired temperature in every part of the structure despite wide differences in exposure, use, occupancy and structural heat losses.



And Zone Control makes it possible to lower temperatures for economy's sake during the part of the day when certain sections of the building are not in use.

For additional, specific information on Honeywell Electronic Moduflow and Honeywell Zone Control, fill in and mail the accompanying coupon now. It will bring you material you'll want to read—and keep handy in your files.

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Minneapolis 8, Minnesota, Dept. HP-3-53

Gentlemen: Please send me information on

☐ Electronic Moduflow ☐ Zone Control

Name _____

Firm Name _____

Address _____

City _____ Zone _____ State _____

INDEPENDENT

"Fabrikated" WALL GRILLES for Commercial Installations

PROVIDE ADJUSTABLE DIRECTED AIR FLOW

331-A

UP OR DOWN

RIGHT OR LEFT

311-A

Made to fit openings in even inches from 8" x 4" to 60" x 40"

Independent Fabrikated* Adjustable Grilles (patented), rigidly constructed with stamped steel rims and steel bars, are made with either vertical or horizontal grille bars. Grille bars are *adjustable* before or after installation; available also with bars permanently set for straight flow.

Write for new Catalog No. 50—gives schedule of sizes, details and prices.

Always Leading — Always Progressing

*Reg. U. S. Pat. Off.

THE INDEPENDENT REGISTER CO.

3747 E. 93rd STREET · CLEVELAND, OHIO

with a total increase of 33 percent in floor space. This was made possible by the acquisition of a major interest in a group of industrial buildings. Along with this expansion, the company laboratory has been enlarged by 50 percent.

Motors on Parade is a 16 mm sound motion picture with a running time of 26 min. It was prepared for *DELCO PRODUCTS DIV., GENERAL MOTORS CORP.*, 329 E. First St., Dayton 1, Ohio, and is designed to show the importance of the electric motor to the home, farm, transportation and industry, and second, to show how electric motors are made on a mass production basis. It was prepared primarily for use by the company's sales department, and is available for group showings.

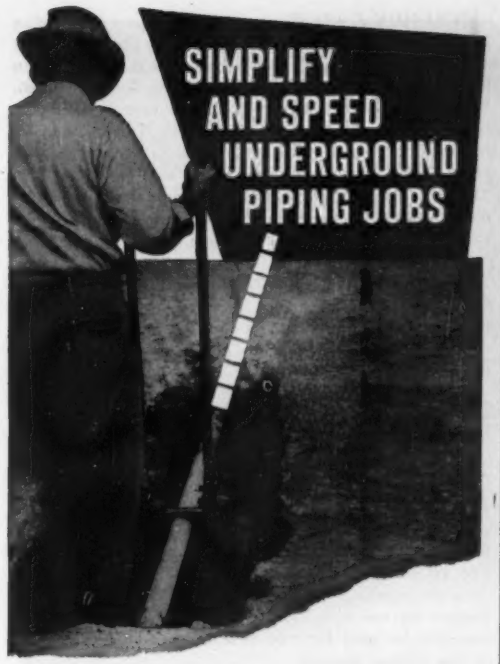
C. W. JOHNSON, INC., heating and piping contractor of Chicago, has moved to 6138 N. Clark St.....A special silver window type room air conditioner was recently presented by *E. A. TRACEY*, vice president in charge of the air conditioning division, *MITCHELL MFG. CO.*, Chicago, to *B. A. MITCHELL*, president, in commemoration of the company's 100,000th room air conditioner.

AUTOMATIC DEVICES CO., INC., has opened a new factory at 714 Hillgrove Ave., Western Springs, Ill., and the main office has been moved from Chicago to the new plant. The eastern office remains at 101 Park Ave., New York 17.

JAMES-POND-CLARK, Pasadena, Calif., has appointed three new stocking distributors for its check valves. They are: *NORMAN ENGINEERING CO.*, 2035 W. Charleston, Chicago, covering northern Illinois, southern Wisconsin, northeast Indiana, and east Iowa; *NIELSEN HYDRAULIC EQUIPMENT, INC.*, 298 Lafayette St., New York 12, covering northern New Jersey, eastern New York, Connecticut, and Berkshire, Mass.; and *SCOTT EQUIPMENT & ENGINEERING CO.*, 1316 Lorain Ave., Dayton, Ohio, covering the southern half of Ohio.

For the fiscal year ending last October, *REMINGTON CORP.*, Auburn, N. Y., reported that sales were up 201 percent, the number of units sold was up 385 percent, and net profits after taxes were up 305 percent as compared to 1949.....The new modern plant of *FLEXIBLE TUBING CORP.*, Guilford, Conn., is now in operation. Production capacity is now increased threefold as compared to the firm's former plant in Branford.

CINCINNATI SHAPER CO., Hopple, Garrard & Elam Sts., Cincinnati, Ohio, has developed a "No-Sag" magnetic sheet support as an attachment for its all-steel shears. It is designed to make easy the job of gaging light gage sheets which sag so much that they do not strike the gaging angle. For example, a 20 ga sheet extending beyond the knife 20 in. will sag approximately 5 in., making it impossible to accurately gage the sheet with the back gage. The support is designed to handle all magnetic materials up to 16 ga thickness and can be supplied with either a 36 or 48 in. back gaging range. At present, the support is available as extra equipment only on new Cincinnati shears.



. . . push pipe under streets, lawns, floors, walks with a

GREENLEE PIPE PUSHER

Cut costs, save time on underground pipe installations this fast, easy way.

With a GREENLEE Hydraulic Pipe Pusher *one man* can push pipe through the ground and under obstructions.

Saves the time, hard work, and inconvenience to all caused by the old methods of tearing up lawns, floors and pavement. Eliminates tedious digging, tunneling, back-filling, tamping, re-paving, as just a short trench accommodates the pusher.

Save with the GREENLEE Pipe Pusher, which often pays for itself on the first few jobs. Learn all about this compact, portable, powerful pipe installing equipment.

Write for details today. Greenlee Tool Co., Division of Greenlee Bros. & Co., 2343 Twelfth St., Rockford, Ill.

TOOLS FOR CRAFTSMEN

GREENLEE

IN STOCK for Your Convenience

AURORA
CLOSE-COUPLED *Package*

AIR CONDITIONING PUMPS

They have EVERYTHING!

- ☑ LOW COST
- ☑ LONG LIVED
- ☑ SMOOTH, QUIET
- ☑ MECHANICAL SEAL
- ☑ DEPENDABLE
- ☑ DISASSEMBLY is QUICK and SIMPLE*

for
EVAPORATOR COOLING TOWERS
•
AIR CONDITIONING UNITS
•
also for
GENERAL SERVICE

Air conditioning contractors as well as manufacturers of air conditioning equipment will welcome these notable close-coupled package pumps. Mechanical seal requires no packing or maintenance. *Pump may be disassembled without disturbing discharge connections or hold down bolts. Sturdy, lasting and efficient.

Capacities up to 150 G.P.H., heads to 100 ft.

Aurora Type JMC Pump — Close-Coupled

CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL is standard on all sizes and located in packing cover.

IMPELLER is balanced, of enclosed type, high grade bronze.

MOTOR — NEMA specifications, Stainless Steel Shaft on JMC — for all circuits and various enclosures.

BALL BEARINGS — on JMC built into motor.

OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large type G.M.C. Close-Coupled Pumps can be furnished up to 800 G.P.M. and heads to 200 ft.

Complete Information on Request

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

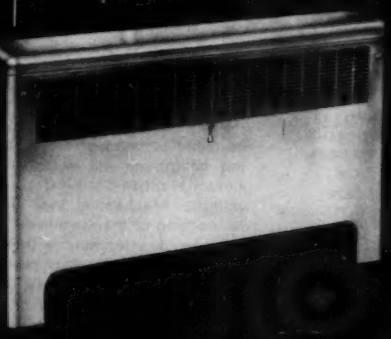
AURORA PUMP COMPANY

80 Loucks St., Aurora, Illinois

■ Designed for Quick, Easy Installation

AIRTHERM

CONVECTORS



Attractive appearance, outstanding performance, and ease of installation have led to an increasing preference for Airtherm Convectors in institutions, apartments, homes and schools. Try AIRTHERM Convectors on your next job.

Airtherm Cabinet design permits quick, easy assembly.

FREE STANDING RECESSED

FOR HEATING SATISFACTION...
Think First of AIRTHERM

AIRTHERM MANUFACTURING COMPANY
711 SOUTH SPRING AVENUE • ST. LOUIS 10, MISSOURI

BENJAMIN F. COOK, consulting engineer specializing in the design of power and industrial plants and the mechanical equipment of buildings, is now located in the Land Bank Bldg., 15 West 10th St., Kansas City 6, Mo.....*N. O. NELSON CO.* has opened a branch sales office and warehouse at Victoria, Tex. (120 miles southwest of Houston). This brings to seven the number of company offices serving the central Texas area. This year marks the 75th anniversary of the founding of the wholesale company which handles heating, air conditioning and refrigeration equipment.

COMBUSTION CONTROL CORP., 77 Broadway, Cambridge 42, Mass., has developed a new "Firetron" flame scanner for use in its line of flame failure safeguards and controls for oil, gas, and combination oil-gas burners. It is said to be smaller than any scanner previously offered and to be sensitive to all types of gas and oil flames, yet to discriminate between the flame and hot refractory.

A unique slide rule selector to aid in choosing the proper heater for thermostat replacement jobs has been prepared by *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, 2604 Fourth Ave. S., Minneapolis 8. The pocket size reference recommends, on one side, heaters for use with the company's primary controls, and on the other, heaters for use with controls of other manufacturers. It can also be used for trouble-shooting where the burner is not cycling properly.

A device for solving the problem of pressure loss at high speeds in geared, rotary vane and centrifugal pumps —in the form of an input booster—is available for commercial use from *F. W. DAVIS*, consulting engineer, 124 Lexington St., Waltham 54, Mass. At high speeds cavitation may occur and cause a drop in output pressure, surges in the flow, pump noise, and impeller or gear and bearing wear. The new venturi device is designed to accelerate the input flow at high speeds, and thus increase the range of speed at which pumps can operate at or near peak efficiency.

NEWAGE INTERNATIONAL, INC., 521 Fifth Ave., New York, is now distributing the new "Ernst" hardness tester. The device is a portable, direct reading tester that can be readily carried and handled and is designed to permit readings on any shape or form of metal. In use, hand grips on the side of the instument are pressed downward to lower the indentor so that its point penetrates into the surface of the material being tested under the action of a helical spring exerting a constant load of 15-½ lb. The movement of the indentor into the material is magnified about 3000 times by the method of displacing liquid from a container into a capillary tube.

METRON INSTRUMENT CO., 432 Lincoln St., Denver 9, has developed the type 25D hand tachometer with new speed measuring ranges: 100-1000, 200-2000 and 500-5000 rpm and fpm; and 10-100, 20-200, 50-500 fpm. Range extending adapters are available to measure speeds as low as 20 rpm and as high as 50,000 rpm for special applications.

Why This Trap Provides Long Life Under the Severest Conditions

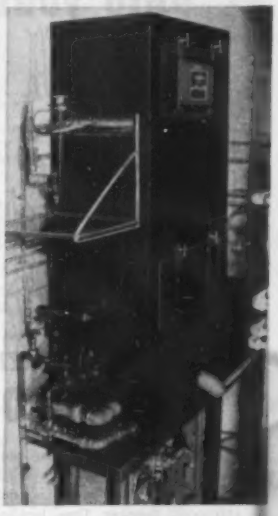
Barnes & Jones Float and Thermostatic Traps are designed and built to handle sudden and large condensate loads efficiently . . . *and dependably.* Trap responds instantly to change in condensate load, requires no change in temperature. Working parts are all easily accessible — and you need no special tools. B&J Float and Thermostatic Traps are made in five sizes and are built to handle loads all the way up to 5750 lbs. of water per hour.

Today, write for full details.

BARNES & JONES, Inc.
206 EUSTIS STREET, BOSTON 19, MASS.
Representatives in all principal cities

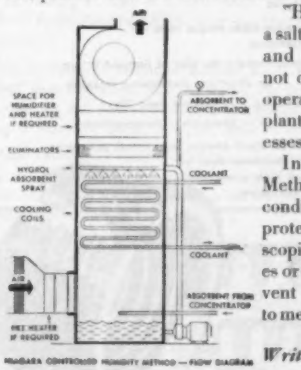
New "Controlled Humidity" Method Gives a Better Solution to Air Conditioning Problems

"Hygrol"
Absorbent
Liquid
Dehumidifies
Fresh Air
Without
Refrigeration



● NIAGARA Air Conditioners or Dehumidifiers using "Hygrol" liquid absorbent give precise control of air temperature and humidity . . . at lower operating cost, with large savings in space and with smaller and less expensive equipment, in many applications.

This method dehumidifies the air by passing it through a chamber in which "Hygrol" spray removes its moisture and produces a low dew point. The "Hygrol" solution resulting is continuously and automatically re-concentrated, providing always full capacity in air conditioning and assuring always a constant dehumidifying capacity and a trustworthy, constant condition for your material, apparatus, process or room to be conditioned.



NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

"Hygrol" is a liquid, not a salt solution; it stays pure and non-corrosive; does not cause maintenance or operating troubles in food plants or in chemical processes.

Investigate this new Method for "comfort" air conditioning as well as to protect quality in hygroscopic material, or processes or instruments, or to prevent condensation damage to metals, parts or products.

Write for Bulletin No. 112

NIAGARA BLOWER COMPANY
Over 35 Years of Service in Industrial Air Engineering
Dept. HP, 405 Lexington Ave. New York 17, N. Y.
Experienced District Engineers in Principal Cities

Build STAMINA into your pipe-lines

Reduce maintenance with D-F S-E* Joints

Shortages of manpower require you to build stamina in your lines. *Directed-Flexing Self-Equalizing, an exclusive feature of Badger Expansion joints, assures all-curve flexing in the corrugated member. Thus, localized flexing stresses cannot form . . . metal fatigue cut to a minimum . . . breakdowns are virtually eliminated.

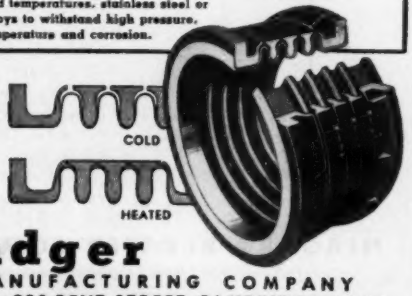
But that's not the whole Badger story. In addition to controlling the flexing movement *within* each corrugation, the specially designed Self-Equalizing Rings also control intra-corrugation movement. For unbeatable stamina be sure you get the exclusive Badger combination — Directed-Flexing Self-Equalising — when you buy . . . specify Badger Expansion joints for every job.

Only Badger Expansion Joints have Directed-Flexing Self-Equalizing rings which progressively control the movement of the all-curve corrugations.

Plus 5 other big features

- **Packless . . . pressure-tight single tube — requires no maintenance**
- **Compact . . . approximately the size of flanged fitting**
- **Special forming . . . no structure weakening stresses**
- **Controlled heat treating . . . assures long life**
- **Wide range of traverse — pressure — temperature**

Fabricated from deoxidised copper for normal pressures and temperatures, stainless steel or alloys to withstand high pressure, temperature and corrosion.



Badger
MANUFACTURING COMPANY
230 BENT STREET, CAMBRIDGE, MASS.

WHO'S WHAT

WILLIAM A. ROBERTS, executive vice president in charge of the tractor division, *ALLIS-CHALMERS MFG. CO.*, Milwaukee, has been elected president of the company, succeeding the late *WALTER GEIST*. The new executive vice president for the entire company is *W. C. JOHNSON*, formerly executive vice president in charge of the general machinery division. *J. L. SINGLETON*, formerly vice president and director of sales for the division, is now vice president in charge of the division. *FRED MACKEY*, former general works manager of the division, is now vice president in charge of manufacturing for the general machinery division.

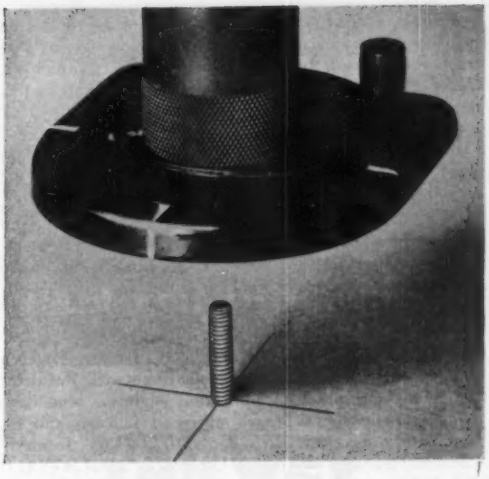
ROBERT T. HASLAM has been elected to the board of directors of *WORTHINGTON PUMP AND MACHINERY CORP.*, Harrison, N. J. Until recently, he was a vice president and director of Standard Oil Co. (New Jersey). A director and member of the executive committee of Ethyl Corp., he is also a member of the Corporation of Massachusetts Institute of Technology. *W. A. FINN* has been named general European manager of Worthington and replaces *A. W. FRASER*, who has been transferred to an executive sales position with headquarters in Chicago.

HAROLD G. INGERSOLL is now vice president of *BORG-WARNER CORP.*, Chicago, and retains the presidency of the company's *INGERSOLL STEEL DIV.*, at Newcastle, Ind. He is also a member of the Borg-Warner board of directors. *DR. MAURICE NELLES* is the new director of the corporation's engineering development section. He was formerly director of the engineering experimental station and professor of engineering research at Pennsylvania State College.

C. A. DUNHAM CO., Chicago, has established a new defense contract office headed by *EDWARD F. FORD*, formerly manager of marketing and promotion, and divisional sales manager. His primary responsibilities are to expedite defense orders, establish priorities and be the final governing authority on the company's production geared to defense needs. *E. W. CARDIFF* has been appointed acting manager of the marketing and promotion department. He had been assistant manager.

WALTER L. DAVIDSON, who has been with *DRAVO CORP.*, Pittsburgh, since 1942 in various positions in the engineering works and machinery divisions, is now sales manager for the heating department. *HENRY G. FIEGER* has been appointed shop manager for the company's fabricated piping plant at Marietta, Ohio. For the past five years he has been eastern regional manager for a steel products company.

UNITED STATES AIR CONDITIONING CORP., Minneapolis, has named *FREDERICK G. RIEDEL* chief engineer in charge of design, development and research activities. He was formerly chief engineer and works director of research at the Holyoke Works of Worthington Pump and Machinery Corp. and had also been previously associated with Houde Engineering Corp. and Carrier Corp.



PIN-POINT FASTENING . . .

FASTER THAN EVER

with Ramset Dual-Action

The improved RAMSET FASTENING TOOL, with ROTO-SET SAFETY SHIELD, still further simplifies, saves time and cuts costs of fastening into steel, concrete, other appropriate materials. You can do your fastening jobs with RAMSET in minutes, instead of in hours needed with old-fashioned methods or inefficient tools.

Takes less than a minute to insert RAMSET FASTENER and power charge, set the new ROTO-SET SHIELD for exact location of fastener—and RAM! The job is done, easily, quickly, at far less cost than other methods. Use either the TAP or the TURN operation, available only in RAMSET DUAL-ACTION TOOL. Wide range of 76 styles and sizes of fasteners to fit practically any work.

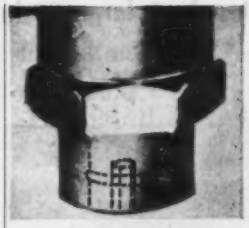
TAP IT . . .

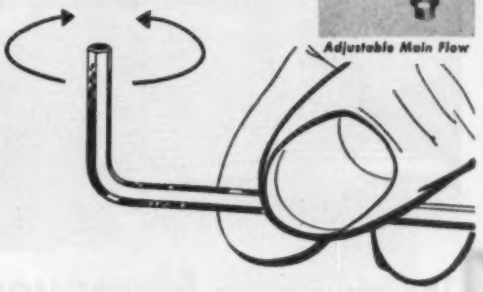
or TURN IT

See DUAL-ACTION in ACTION!

Your local RAMSET Specialist will do a sample fastening job for you, to show you the time and money-saving advantages of RAMSET. To get the work finished easier and faster, at less cost, use only RAMSET TOOLS and genuine RAMSET FASTENERS and power charges. Send for details. *Ramset Fasteners, Inc., 12117 Berea Road, Cleveland 11, Ohio.*

Ramset Fastening System
Pioneer in powder-actuated fastening





Adjustable

Oil Burner

Automatic Valves

The Main Flow adjustment in Bulletin 8281 Valve permits the operator to regulate the flow of oil through the valve when it is open. It's a "regulating" as well as a "Shut-Off" Valve. When de-energized, it closes fully, shutting off the flow completely. It is Factory Mutual Approved.

The By-Pass adjustment in Bulletin 8291 Valve permits a "high or low" flame operation. In other words, the amount of flow can be controlled for full flow or by-pass flow automatically by instrument. It is not a Shut-Off Valve, however, since it does not close completely.

These two ASCO Control Valves are for special cases. Both come in ⅜ and ½ inch pipe size. Both are suitable for gas, light oil, heavy oil (No. 4, 5, 6 and Bunker C) air, water and other non-corrosive fluids at temperatures up to 212° F.

We have other types of Automatic Solenoid Valves for Shut-Off and other purposes not only in the restricted flow types, as these two valves, but in the full flow class. If you will tell us about your automatic control problems, we shall be glad to recommend the proper type.

ASCO Solenoid Valves

When in need of Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and Specialized Electromagnetic Controls, come to us.

Automatic Switch Co.
339 LAKESIDE AVENUE · ORANGE, NEW JERSEY

Solve toughest large scale ventilation problems

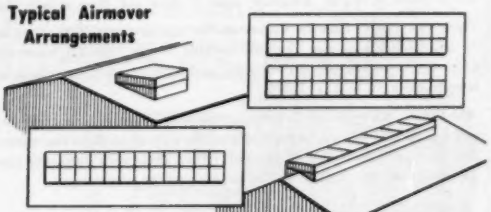
The low-contour Airmover for high-capacity air movement

You can have all the ventilation you want—at economical cost. Airmover exhausts large quantities of heat, smoke or fumes rapidly through its short-air-travel, low-air-friction construction. It's only 32 inches high, built in rectangular units that can be placed on any type roof.

Install any number of units in continuous runs. You literally can "open your roof to the sky", yet have full weather protection. Single units or shorter runs prove effective over specific "hot spots". The low contour and unusual flexibility have made Airmover the popular industrial ventilator. Write for Folder 326F.

The Swartwout Line includes a variety of gravity and powered ventilators.

Typical Airmover Arrangements



The Swartwout Co.

18511 Euclid Avenue • Cleveland 12, Ohio

Industrial Ventilation Specialists Since 1904

DAVID E. FEINBERG, in addition to his duties as manager of the refrigeration division, is now defense contract coordinator for United States Air Conditioning. *BURTON S. FOX* has been named to assist him in this newly created post.

FRANK B. JOHNSTON, JR., is the new assistant manager, merchandised products sales division, *HERMAN NELSON DIV., AMERICAN AIR FILTER CO., INC.,* Moline, Ill. He was formerly manager of the Cleveland branch office of Herman Nelson. *W. J. KILLIAN,* formerly Cincinnati branch office manager, has been named to the newly created position of Cincinnati regional manager for the unit ventilator sales division.

He is succeeded by *WALTER H. RIEGER* who has been a sales engineer with Minneapolis-Honeywell Regulator Co. Two new product application engineers who have joined the division's branch office in Chicago and St. Louis are, respectively, *HUGH H. MULLANEY,* formerly Cleveland manager for General Controls Co., and *DONALD W. FINK,* former service engineer for Minneapolis-Honeywell Regulator Co.

HOLABIRD & ROOT & BURGEE, 69 year old architectural and engineering firm of Chicago, has broadened its construction-engineering service and has named *HAROLD C. WYATT* chief mechanical engineer. He formerly was assistant chief engineer for seven years in the early 20's with Holabird & Roche, the original office of the present firm. . . . . *ROBERT W. LEA,* who has retired as president of *JOHNS-MANVILLE,* has joined *OLIN INDUSTRIES, INC.* He has been an Olin director since last April.

S. CHARLES ROTHMANN has joined *DEERE AND CO.,* Moline, Ill., as director of the industrial hygiene section of the company's department of industrial health and hygiene. He comes to the firm with over 20 years of experience in industrial hygiene engineering and research and will be in charge of the new industrial hygiene laboratory.

The Newcomen Medal "for achievement in the field of steam" was awarded to *ISAAC HARTER,* chairman of the board, Babcock & Wilcox Tube Co., Beaver Falls, Pa., at a recent joint meeting of the Newcomen Society and the Franklin Institute. Among the achievements which led to his nomination for the medal were the furthering of research to remove diffused oxygen from boiler feedwater and the application of this research to boilers into which were constructed economizers built with steel tubes.

MELVIN C. ASPHOLM, comptroller of Carrier Corp., and *BEVERLY D. TAYLOR,* controller, Robertshaw-Fulton Controls Co., have been elected to membership in the *CONTROLLERS INSTITUTE.* Established in 1931, the institute is a nonprofit organization of controllers and finance officers from all lines of business.

PAUL R. KENNEDY is now regional sales manager, with headquarters in Chicago, of *SERVEL, INC.,* Evansville, Ind. He was formerly district sales manager in

for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. Write for new Bulletin N-616.

YARNALL-WARING COMPANY
107 Mermaid Avenue Philadelphia 18, Pa.

Peerless Electric

PRESSURE BLOWERS
FOR SMALL EXHAUST SYSTEMS AND FOR CONVEYING, COOLING, ETC.

PRODUCE A LARGE VOLUME OF AIR AT HIGH STATIC PRESSURES

• Peerless Electric pressure blowers are designed to produce a large volume of air at high static pressures with the advantages of a self cleaning paddle wheel.

These blowers are recommended for small exhaust systems where air is laden with dust or grit, and also for supplying high pressure air for conveying, cooling, etc.

The blowers are made in four sizes, with motors of ⅛, ⅓, ¾ and 2 H. P., and wheels 7¾ x 2, 9 x 2½, 10⅝ x 2½, and 12½ x 2½, respectively.

WHEELS—Constructed with straight radial blades supported on a heavy back plate with heavy cast-iron hub, dynamically balanced and designed for efficient operation.

HOUSINGS—Arc-welded 16-gauge steel housings and motor bases for rigidity and long life.

MOTORS—Standard blowers furnished with single phase Capacitor-Induction type or three phase Induction motors. All are equipped with ball bearing, rigid mounted motors. Also available in other current characteristics for special applications.

ROTATION and DISCHARGE—Furnished for clockwise rotation, bottom horizontal discharge unless otherwise specified. At time of installation housings or wheels may be turned for other discharges and rotation if so desired.

CAPACITIES—Tested and rated in accordance with codes adopted by National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.

GUARANTEE—Units are guaranteed against defective workmanship or material for a period of one year from date of shipment from factory. Each unit when shipped is registered and the serial number identifies it immediately for spare parts or duplicates.

Write for sheet giving complete specifications and prices.

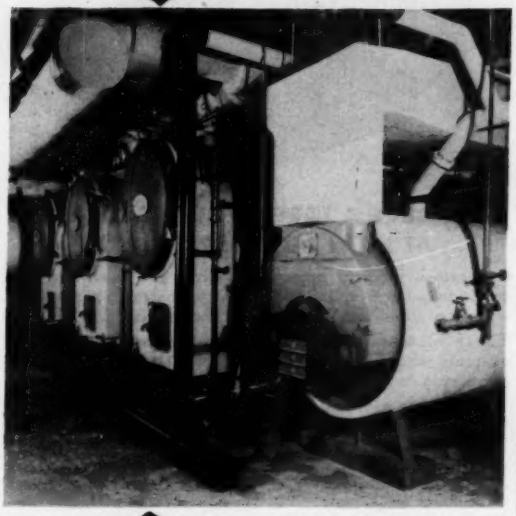
THE PEERLESS ELECTRIC COMPANY
Established 1893 • WARREN, OHIO

Peerless Electric
MOTORS • FANS • BLOWERS

For "Bedrock Economy" in HEATING and POWER

Choose and use

TITUSVILLE BOILERS



Compact, efficient layout distinguishes this Titusville boiler installation.

Here in the boiler room of the new Booker T. Washington High School in Shreveport, La., are shown three Titusville "Compact" Steel Heating Boilers (total rated capacity in excess of 36,000 sq. ft.), with a 30 H.P. Titusville "Wee Scot" marine boiler serving laundry and kitchen. The complete range of Titusville boilers enables many ideal service combinations. *Write us for details.*

THE TITUSVILLE IRON WORKS COMPANY

A division of Struthers Wells

Representatives in Principal Cities

TITUSVILLE, PENNSYLVANIA

Los Angeles and succeeds *A. F. LEE*, who has been appointed national utility sales development manager with headquarters in the home office.

Consolidated-Ashcroft-Hancock division of *MANNING, MAXWELL & MOORE, INC.*, has appointed *ROBERT E. MASON* as director of mobilization planning for the division and *LESLIE T. WILLARD* as works manager of the combined Bridgeport and Stratford, Conn., plants. Mr. Mason had been works manager of the Bridgeport plant and Mr. Willard has been works manager of the Stratford plant for the last three years.

WILLIAM ENSIGN has been promoted to assistant sales manager of *MARSH HEATING EQUIPMENT CO.*, sales affiliate of *JAS. P. MARSH CORP.*, Skokie, Ill. He has been with the organization for several years in a sales capacity at the home office.

ALLEGHENY LUDLUM STEEL CORP., Pittsburgh, has announced a series of promotions in its sales department. *DR. R. A. LINCOLN*, former assistant manager, is now managing the sales development and engineering service department. He succeeds *WILLIAM B. PIERCE*, who is now technical director of the company. *C. R. MITCHELL*, formerly assistant to the manager of stainless steel sales, is now manager of stainless strip sales. This is a newly created position.

R. S. ROBINSON, assistant to the general manager of sales, has been named to the newly created position of manager of carbon steel sales. *FRANK F. YOUNG*, associated with the Pittsburgh district sales office for many years, is now assistant manager of the branch.

DAVID C. PRINCE, vice president of *GENERAL ELECTRIC CO.*, Schenectady, N. Y., has been named to the president's staff, with special duties as assigned. *HARRY A. WINNE*, vice president in charge of engineering policy, has been assigned responsibility, formerly held by Mr. Prince, for the company's general engineering laboratory.

Concurrently, *ERNEST E. JOHNSON*, formerly manager of engineering for the large apparatus divisions of the apparatus department, has been named to the newly created post of general manager of the laboratory. *EVERETT S. LEE* is the new editor of the company's monthly engineering magazine. He succeeds *EDWARD C. SANDERS*, who retired recently. Mr. Lee was formerly executive engineer of the company's general engineering laboratory in Schenectady.

BAKER ENGINEERING CORP. has been appointed a prime distributor in the southern California area for *BAKER REFRIGERATION CORP.*, South Windham, Me. The new firm will continue the sales, contracting, manufacturing and service operations that have been performed by the Baker factory branch in Los Angeles.

Officers of the new corporation are: *C. E. HOLLINGWORTH*, president and general manager; *HAYES T. CORY*, vice president and chief engineer; *T. H. SHON-*

Beauty and Strength for Your Boiler...

...with an exclusive design by Atlas

A boiler jacket by Atlas serves two important purposes. First—its functional design cuts installation time to a minimum. Saves labor costs—*increases profits.* Secondly—its beauty of design lightens your sales load—finds new prospects—enlarges your market. Moreover—an Atlas jacket is yours alone . . . built to *your* specifications, designed to best fit *your* market demands.

Send Your Boiler Specifications to Us for Cost Estimates

Atlas MANUFACTURING CO.

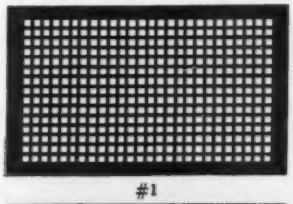
EUSTIS AT ROBBINS ST. ST. PAUL 4, MINN.

ALSO MANUFACTURERS OF
FURNACE CASINGS and BLOWER HOUSINGS

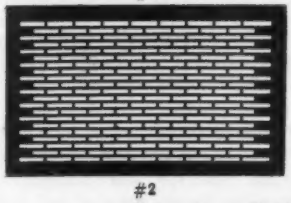
For Every Requirement ... A-J REGISTERS and GRILLES

A-J offers a complete line for the largest to the smallest jobs—you can install them with full assurance of the best possible quality and performance. A-J Registers and Grilles are made to *last* and designed to harmonize perfectly with any architectural styling.

The A-J Line will be a valuable adjunct to your planning programs. Write us for more complete details.



#1



#2

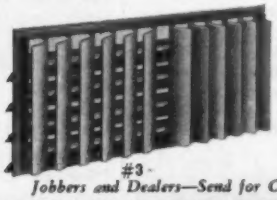
Here are several illustrations to help show the variety of the A-J line.

#1—Plain Lattice Design with 53% area. Especially popular for ventilating systems.

#2—Slotted Design—73 to 75% free area. Particularly suited to tasteful architectural motifs.

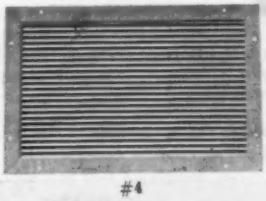
#3—Double Diffusers. Ideal for jobs where large volumes of air must be controlled. Also available as single diffusers where horizontal deflection is not required.

#4—#700 Series No-Vision Door and Partition Grilles. Available with channel or flange frame. The 700 A-B grilles offer maximum free area yet are completely sight proof.



#3

Defense Order Will Get Special Priority On Delivery



#4

Jobbers and Dealers—Send for Catalog

A-J MANUFACTURING CO.

2119 Washington St. Kansas City 8, Mo.

— — *and now* — —

THERM-O-TILE

Reg. U. S. Pat. Off.

UNDERGROUND STEAM CONDUIT

is being installed in the huge

PATERSON, N. J. HOUSING PROJECT

KNOWN AS

COLONIAL SITES

Public Housing Project, N. J. 21-2
Housing Authority of the City of Paterson
Kelly & Gruzen — Architects — Engineers

Therm-O-Tile is produced, distributed and installed by the Porter-Hayden Companies, nationally known Insulation Engineers and Contractors.

Therm-O-Tile is represented by Johns-Manville Technical Service Units in all principal cities.

H. W. PORTER & CO., INC.

822-H Frelinghuysen Avenue • Newark 5, N. J.

REID HAYDEN, INC.

BALTIMORE, MD. RICHMOND, VA. CHARLOTTE, N. C.

Insulation Engineers & Contractors

FELD, treasurer and assistant chief engineer; *NEAL S. TEMPLIN*, secretary. All of the officers, except Mr. Templin, have been with the Baker organization for many years.

RALPH M. WESTCOTT, a consulting engineer specializing in water use and quality control for heat exchange equipment, has been appointed acting executive secretary of the *REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATION OF SOUTHERN CALIFORNIA*. He succeeds *NEAL S. TEMPLIN* and will continue his activities as a consulting engineer, being employed by the association on a part time basis.

WORTHINGTON-GAMON METER CO., Newark, N. J., formerly a subsidiary of *WORTHINGTON PUMP AND MACHINERY CORP.*, has been made a division of that corporation. *ROBERT R. ANDERSON*, formerly president of Worthington-Gamon, has been elected vice president of the parent company and will act as general manager of the new division.

WILLIAM C. FLANDERS, formerly vice president of the meter company, has been appointed assistant general manager of the division and *WALTER H. ZEIS*, secretary and treasurer of the meter company, is now assistant secretary of the corporation.

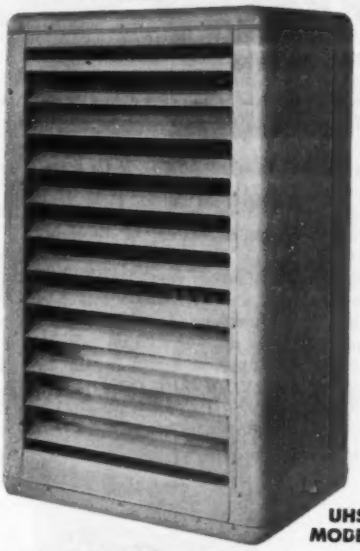
PHILIP CAREY MFG. CO., Cincinnati, has named *L. CHARLES UNDERWOOD* assistant advertising manager. He joined the company in 1947 and was recently engaged in sales and promotional field work..... *W. G. MILLER*, who has been assistant works manager of the motor and control division of *WESTINGHOUSE ELECTRIC CORP.*, in Buffalo, is now manager of manufacturing for the division.

CHARLES BANGERT, JR., is now in charge of all engineering activities of *TRUMBULL ELECTRIC MFG. CO.*, Plainville, Conn. He joined the company in 1947 as designing engineer and last year was named assistant manager of engineering. *J. J. PASCHER* is the new district sales manager of the company's New York district. He had been manager of the Hartford office of General Electric Co.

At the recent annual meeting of *THE ALUMINUM ASSOCIATION*, *A. P. COCHRAN*, of Cochran Foil Co., Inc., was elected president. *A. V. DAVIS*, Aluminum Company of America, was re-elected chairman of the board, and *DONALD M. WHITE* was re-appointed secretary and treasurer. Vice presidents for the ensuing year are: *I. T. BENNETT*, Revere Copper and Brass Inc.; *L. M. BRILE*, Fairmont Aluminum Co.; and *E. G. FAHLMAN*, Permold Co.

FRANK J. THOMPSON has been named director of purchases for *L. J. MUELLER FURNACE CO.*, Milwaukee. Prior to joining the firm, he was associated with Harnischfeger Corp., where he was electrical and, most recently, steel buyer.....The power plant equipment division of *SWARTWOUT CO.*, Cleveland, has established a company-operated sales office to service the

JOHN ZINK
UNIT HEATERS
Two Designs Available



UHS MODEL

For clean, safe, trouble-free heating of industrial and commercial establishments, gas-fired suspended heaters have proven themselves and assure customer satisfaction. A complete, packaged unit fully automatic, the heaters are suspended from the ceiling to conserve valuable floor space and yet are designed so that they will be an attractive addition to any shop or store.

A.G.A. Approved for Natural, Mixed, Manufactured or LP Gas

UH-4 MODEL

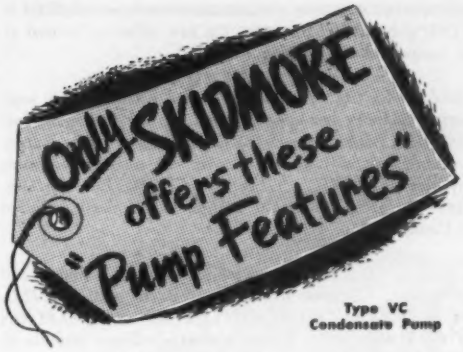
Write for Literature

JOHN ZINK COMPANY

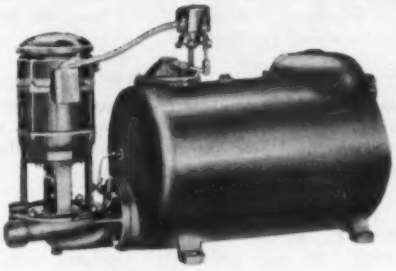
4401 SOUTH PEORIA

TULSA, OKLAHOMA

New York — Salt Lake City — Houston — Los Angeles



Type VC Condensate Pump



Features

A FAVORITE FOR OVER A QUARTER OF A CENTURY . . . SKIDMORE TYPE VC CONDENSATE PUMP FEATURES: Low inlet connection . . . eliminates recess pits to accommodate low returns. Sturdy cast iron construction and perfect balance . . . eliminates noise and vibration. The entire motor and pump unit may be removed for inspection or repair — without disturbing piping.

● **New Bulletin No. 10-B**

Send for your copy of the Skidmore VC Condensation Pump bulletin which gives complete information and engineering data on this pump—or information on any other type Skidmore Pumps will be sent on request, without obligation.

Skidmore Pumps

ST. JOSEPH, MICHIGAN

northeastern Ohio area. Under the direction of *HAROLD C. DOUDA*, district manager, the new office is located at the company's main plant.

BELLOWS CO., Akron, Ohio, has established a west coast regional headquarters office in Los Angeles. *GEORGE COOK*, formerly of Conapco, Inc., is in charge. The company will also take over all distribution sales activities for *SMITH-JOHNSON CORP.*, Los Angeles, manufacturer of pneumatic equipment formerly handled by Conapco, Inc.

RAYMOND D. BERRY, vice president of Gallaher and Speck, Inc., has been re-elected president of the *BUILDING CONSTRUCTION EMPLOYERS ASSOCIATION OF CHICAGO, INC.* Other re-elected officers include *H. JAMES MURRAY*, president, Mellish-Murray Co. — first vice president; *S. AUSTIN POPE*, president, W. A. Pope Co. — second vice president.

A. G. HENDRICKSON has joined *A O. SMITH CORP.*, Milwaukee, as welding equipment sales manager. He will function under *L. F. VONIER*, welding division sales manager, who until now has actively managed sales of both electrodes and welding machines.

The new manager of application engineering for *TRION, INC.*, McKees Rocks, Pa., is *WILLIAM R. MURDOCK*. He was previously associated with the American Chain and Cable Co. as a sales representative of the R-P & C Valve Division.....*ILLINOIS ENGINEERING CO.*, Chicago, has appointed two new sales representatives, *FRANK BRESNIHAN*, 170 Summer St., Boston, and *SNOOK, PLATT & MASON*, RR4 — Box 199, South Bend, Ind.

ARTHUR E. AKEROYD, of Boston, has, for a number of years, represented the electronic tube and equipment sales divisions of *RAYTHEON MFG. CO.* He is now also handling New England representation for *RUSSELL ELECTRIC CO.*, Chicago, a Raytheon subsidiary.....*DONALD F. DEAKIN* has joined *ATLAS MINERAL PRODUCTS CO.*, Mertztown, Pa., as water and sewer products director, and *NEWTON O. DUNCAN, JR.*, a recent graduate of Texas A & M College, has joined the company and has been assigned to the Houston office.

The advancement of *FRANK C. HAWK* to general sales manager and *NORTON R. MILLER* to assistant general sales manager has been announced by *CECIL BOLING CO.*, New York, representative of Bush Mfg. Co. and Heat-X-Changer Co. Mr. Hawk has been a member of the Boling organization for seven years in the New York metropolitan area, and Mr. Miller has been associated with a number of heating and air conditioning equipment manufacturing firms.

ROSS OPERATING VALVE CO., Detroit, has named *DOMENIC A. DiTIRRO* to head its sales and technical service engineering divisions. He was formerly chief research and development engineer for Parker Appliance Co.

MORE COOLING for your dollar

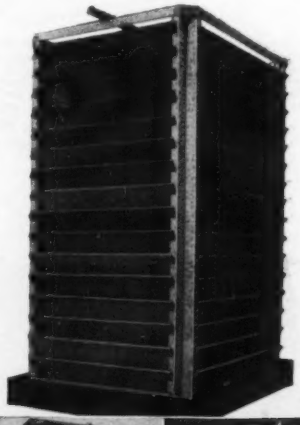
BINKS NATURAL DRAFT COOLING TOWERS CUT YOUR WATER COSTS

No longer need you waste quantities of expensive cooling water. Binks Type "S" natural draft cooling towers will slash your cooling water bill to almost nothing. You recirculate the same water through the tower again and again. A small pumping cost replaces high water bills.

long-lasting construction...many sizes Sturdy construction insures years of trouble-free service. Tower frames are rigidly constructed of galvanized steel with louver posts hot-dipped galvanized after fabrication. Towers are made in a variety of types and sizes with capacities ranging from 2.4 to 1200 tons of refrigeration.

many applications Binks Type "S" towers are ideal where air movement is unrestricted*...the accepted standard tower for cooling condenser circulating water from refrigeration and air conditioning compressors ...for cooling water-jacketed engines... or for low-cost cooling in many manufacturing processes where heat is dissipated by spraying water or other fluids.

*Ask about Binks mechanical draft towers for locations where air movement is limited.



Send Today for free bulletins which give full information about Binks Type "S" towers.

Bulletin 30—Single section towers
Bulletin 31—Multiple section towers
Bulletin 32—Large capacity towers

Please state how tower will be used, also capacity required.

Clog-proof Rotojet nozzles, used exclusively in Binks towers, are designed to give maximum fluid break-up.

THERE'S A BINKS TOWER FOR EVERY COOLING JOB

Binks MANUFACTURING COMPANY

REPRESENTATIVES IN ALL PRINCIPAL CITIES ■ 3118-38 CARROLL AVENUE, CHICAGO, ILL.

hot water in a hurry!

Where sudden hot water pulls—or an unpredictable time schedule—are in the order of things, install

Paracoil INSTANTANEOUS WATER HEATERS

TO KEEP PACE WITH THE LOAD—ALL THE WAY!

No storage tank is necessary—they have enough, and more, heating surface built into them to heat the water as fast as it is drawn! Thousands in use.

If you have such a problem, we have the answer! Stock designs permit quick deliveries...at prices lower than you think!

Write today for a copy of our new Bulletin 70 Section I, describing this line of Paracoil Water Heaters.

This bulletin, in addition to tables of capacities and physical dimensions on our U-Tube designs, contains a wealth of practical, worthwhile engineering data on how to size, figure steam requirements, and pipe up PARACOIL INSTANTANEOUS WATER HEATERS. YOUR COPY AWAITS YOU!

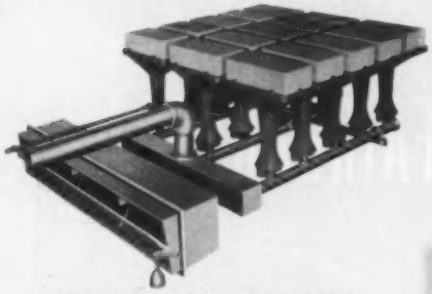
DAVIS ENGINEERING CORPORATION

1064 East Grand Street, ELIZABETH 4, NEW JERSEY
30 Rockefeller Plaza, NEW YORK 20, NEW YORK

AGENTS IN PRINCIPAL CITIES

WEBSTER SERIES F 600 BURNER

For Low Pressure Gas



Designed for LOW GAS PRESSURE
INTERCHANGEABLE PORTS
RADIANT fire brick top
NO COMBUSTION CHAMBER required
Will NOT VIBRATE
LOW draft loss
ANY SHAPE and SIZE
INTEGRALLY MOUNTED pilots

●

WEBSTER KINETIC* BURNER

For Low Pressure Gas

The Webster Kinetic consists of a multiplicity of full venturi mixers with flame retention nozzles. These are assembled in a metal casing complete with pilot and louvre. It may be used with natural, mixed or liquefied petroleum gases. Standby oil burners may be used when desired. As a multiple head assembly it is available in 25 standard sizes of from 4 heads to 48 heads, and can be supplied in any size or shape. Natural gas input ratings from 560,000 Btu/hr to 6,720,000 Btu/hr at 4" wc.

For complete information request Series B8 Bulletins.

*TRADEMARK

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

FILLING THE
"spec"
A HABIT
WITH
FAIRBANKS®

"1407 BROADWAY" — 42 stories — the latest word in industrial architectural design and again FAIRBANKS Valves are on the job. The plumbing, heating, sprinkler and air conditioning systems — all FAIRBANKS Valves.

Why this preference? What is the answer? Look at the facts:

1. A complete line of bronze and iron body valves.
2. A reputation for quality achieved during fifty years of valve manufacturing experience.
3. A progressive engineering policy that has stimulated and incorporated improvements in designs. The U-01 150 lb. renewable composition disc bronze globe valve, of which over 3000 were used in "1407 Broadway", is a typical example of this policy.
4. A modern manufacturing plant utilizing the newest production machinery and inspection devices, operated by personnel who gained their "know-how" by experience.
5. A spirit of team work, cooperation and pride in a job well done that is symbolical of THE FAIRBANKS COMPANY.

Architects: Kahn & Jacobs, New York City
General Contractors: J. H. Taylor Construction Co., New York City
Consulting Engineer: Charles Mayer, New York City
Plumbing Contractor: Jarcho Bros., Inc., Long Island City, N. Y.
Heating Contractor: Sprinkler Contractor: Air Conditioning Contractor: } Reisler Corporation, New York City

THE Fairbanks COMPANY
393 LAFAYETTE STREET • NEW YORK 3, N. Y.
Branches: New York 3 • Pittsburgh 22 • Boston 10 • Rome, Ga.
TRUCKS • CASTERS • DART & PIC UNIONS • VALVES

NEW BOOKS & REPORTS

Instrumentation Text Stresses Fundamental Principles

The rapid development of new industrial methods and techniques has brought the subject of measurement into a science on its own physical foundation and has extended its scope far beyond the elementary concepts of temperature and pressure determination. New measurement methods based on both new and old physical phenomena are becoming common in industrial operations.

Industrial Instrumentation, by Donald P. Eckman, of the college of engineering, Cornell University, is an introduction to the science of measurement, and it reviews the principles of those methods of measurement employed in industrial processing and manufacturing. Primary emphasis is given to the method rather than to the mechanism. However, attention is given to the practical details.

Leading off with a chapter on the qualities of measurement, the text deals with expansion and resistance thermometers, thermoelectric temperature measurement, and radiation temperature measurement. It includes a number of chapters covering the measurement of pressure, vacuum, head and level, and fluid flow. The last chapter of the book deals with process instrumentation and provides information on the types of instruments used in numerous processes.

This 395 page book is intended primarily for the undergraduate in engineering. With the exception of a few sections containing differential equations, it is assumed that the student is familiar with the elements of calculus, mechanics, thermodynamics and fluid mechanics beyond elementary courses in physics. It is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, and is priced at $5.00.

Annual Report Issued by ECPD

The Engineers' Council for Professional Development is a conference of engineering bodies working to improve the methods by which a man becomes an engineer, to increase usefulness of his engineering studies, and to clarify the procedures by which he becomes recognized professionally. The council is supported financially by grants from its eight constituent engineering organizations and by the Engineering Foundation. Its main work is accomplished by 350 practicing engineers and educators.

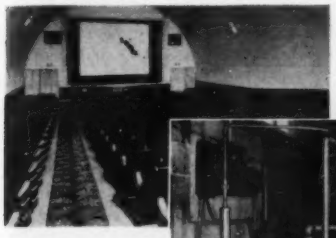
The 18th annual report of the council contains the reports of its chairman, the standing and special committees, the representatives of the constituent societies, lists of accredited undergraduate engineering curricula and technical institute programs, and its financial statement. Of the achievements of ECPD, probably the best known is the work of its committee on engineering schools which, since 1935, has examined and accredited 656 engineering curricula in 142 engineering schools of the country. The 1950 listing is contained in this report which may be obtained from the council's headquarters at 29-33 W. 39th St., New York 18, for 50 cents. Separate reprints of the Accredited Undergraduate Engineering Curricula in the United States may be obtained for 25 cents.

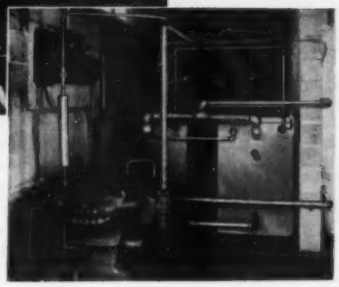
NORWAY THEATRE

maintains 75° comfort with

DOLE *Ice-Cels*

DOC DOLECO *says*-
FOLKS CAN RELAX
IN SOLID COMFORT-
ON HOTTEST DAYS
WITH ICE-CEL!





Relatively little space in the basement of the theatre is required for the installation because of the neat, compact design of DOLE Ice-Cels.

With mid-day temperature of 96° Norway Theatre of DeForest, Wisconsin, last summer maintained a comfortable 75° for its 1300 patrons from morning until midnight with two DOLE Ice-Cels powered by a 7½ H.P. condensing unit. A 78 G.P.M. water pump, 21 sq. ft. water coil, 11,000 C.F.M. fan, and controls, supplement the DOLE Ice-Cels. Water delivered from the Ice-Cels is at 34° and return water at 40°. The compressor runs but little of the time and the management is completely satisfied with the installation.

Norway Theatre has a seating capacity of 422 and is 40 feet wide by 30 feet high by 100 feet long. Insulation consists of 2 inches of spun glass and 6 inches of air space while the interior is lined with Celotex.

On your next theatre job, investigate DOLE Ice-Cels. They'll make profits for you by the customer satisfaction they give. **Write for Engineering Bulletin 8-ES.**

DOLE manufacturing facilities including modern machinery and trained personnel for sheet metal working are available for the handling of Government orders. We invite your inquiries.

DOLE Vacuum COLD PLATES

DOLE REFRIGERATING CO.

5918 N. Pulaski Rd., Chicago 30

103 Park Ave., New York 17
44 Elgin St., Brantford, Ont.

McCORD

HEATING AND AIR CONDITIONING PRODUCTS

BLAST HEATING COILS—AIR CONDITIONING COILS—ALL TYPES

All copper spiral fin tube construction with the tubes formed or bent permits uniform expansion without strain. Headers are heavy wall construction with tubes brazed into extended ferrules formed in the headers. Fins are helically wound and metallically bonded. May we send catalog?

VERTICAL TYPE UNIT HEATERS

A proven heating unit, modern in design, incorporating every unit heater advancement. McCord copper spiral fin tube construction creates air turbulence without undue restriction. Improved fan blades deliver large volume of air with minimum air noise. Guaranteed for 150 lbs. saturated steam pressure. Specify McCord.

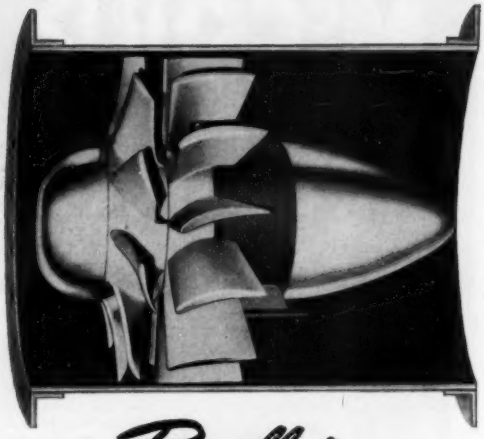
HORIZONTAL TYPE UNIT HEATERS

A time proven heating unit, modern streamlined in design, quiet, yet its rugged construction adapts it to all types of installations, guaranteed for use on No. 150 p. s. i. steam pressure. All copper heating element, individual spiral fin tubes free to expand without strain on joints. Standard motors with standard bases used. Wide range of capacities.

Save fuel with McCord Unit Heaters.

McCord CORPORATION
DETROIT 11, MICH.

A new peak in fan efficiency



Propellair

VANEAXIAL FANS

Give you *non-swirl* airflow

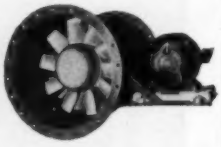
■ This new fan gives you 80% to 90% efficiency—far higher than most propeller fans. Its airfoil blade sections and airfoil guide vanes prevent air swirl, increase pressure.

Propellair Vaneaxial is a compact, self-contained drum unit that is easily installed in fresh air intakes, fume or dust removal systems, or other air ducts. This fan gives you rugged construction, low noise level, economical installation and operation.

Propellers and guide vanes are cast aluminum. Propeller shaft and motor have deep row ball bearings, for operation in any position. Standard NEMA motors on all connected models. Available in 20, 24 and 30 in. diameters—4,000 to 15,000 cfm, Certified PFMA Ratings.

BELT-DRIVEN DESIGN
(Motor outside airstream)

This type of Vaneaxial Fan is for use under conditions involving corrosive fumes, inflammable dust, or explosive vapors. Performance characteristics are similar to direct drive models.



Write for complete data

Our new Catalog H-785-P will give you full information on Propellair Vaneaxial Fans. Write for it. If you have a specific problem, send us the details and a ventilation specialist will make recommendations in your plant. There's no charge—no obligation. Write wire or phone us.

PROPELLAIR
DIVISION OF ROBBINS & MYERS, INC
SPRINGFIELD · OHIO

National Research Council Reports on Design of Laboratories

In spite of the great growth of scientific research during the past two decades, there has been lacking a reference source of constructional information on laboratories. In 1924 the National Research Council formed a committee on the construction and equipment of chemical laboratories. A report of this committee was published in 1930, and the committee was re-appointed from year to year to serve as a source of information on laboratory design until 1943, when it was temporarily disbanded. In 1947, the committee was re-activated and was charged with the responsibility of preparing a new report to replace the 1930 treatise.

The new report, entitled Laboratory Design, is edited by H. S. Coleman, head of the council's committee on the design, construction and equipment of laboratories, and former assistant director of the Mellon Institute of Industrial Research. The book is intended to be especially helpful to laboratory directors and teachers and to architects and engineers, not only in planning and building, but also in remodeling and enlarging. Its contents are concerned solely with where scientific work can be done well.

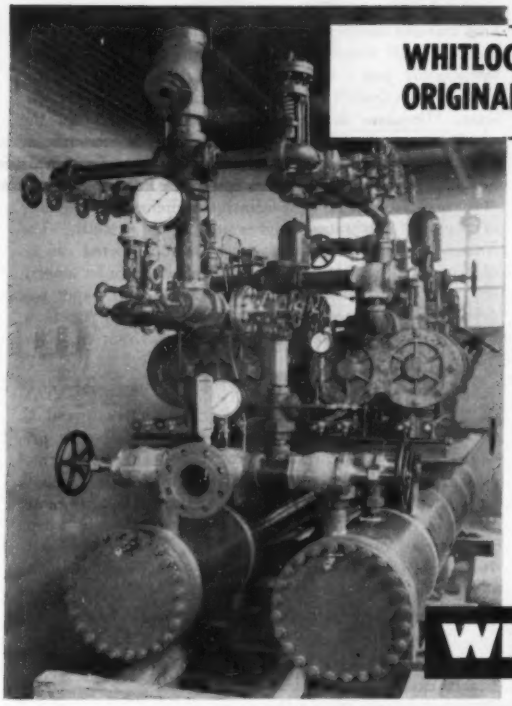
The book is divided into four major parts, the first containing a general discussion of interior construction materials, furniture, piping, light, power, ventilation, and safety features. Part II is on teaching laboratories, with discussions included on virtually all phases of design, from site selection to interior arrangements. This section has chapters devoted to various types of laboratories, such as analytical and organic chemistry, physical and electrochemical, biochemical, chemical engineering, etc. Part III deals with industrial laboratories, with chapters devoted to special types and their auxiliary rooms. The last part of the book is of unusual interest because it contains concise descriptions of some modern laboratories, complete with plans, sections, and photographs.

The chapter on piping was prepared by John Edmund York, of Stone & Webster Engineering Corp. It briefly discusses the handling of steam, condensate, city water, well water, hot water, deionized and distilled water, compressed air, vacuum, city gas, hydrogen, oxygen, nitrogen, hydrogen sulphide, refrigerants, etc. The chapter on laboratory ventilation was prepared by W. C. L. Hemeon, of the Industrial Hygiene Foundation, Mellon Institute. It deals principally with exhaust systems wherein the contaminant is withdrawn at its point of origin.

Published by Reinhold Publishing Corp., 330 W. 42nd St., New York City, the book is clothbound, and contains over 390 8½ × 11½ in. pages. The price is $12.00.

Revises Refresher Notes For Engineers' License Exams

Refresher Notes for Professional Engineers' License Examination, by John D. Constance, is a short refresher course on the fundamental concepts, methods, and practical applications of the basic engineering sciences, including hydraulics, thermodynamics, and machine design as presented by the author in a 20-lecture course sponsored by the American Society of Mechanical Engineers, Metropolitan Section, New York City. It is arranged as a convenient and time-saving instrument for graduate engineers



WHITLOCK OIL HEATERS SELECTED BY ORIGINAL EQUIPMENT MANUFACTURERS

Again and again Whitlock Oil Heaters are the choice of discriminating oil burner equipment manufacturers to meet their exacting requirements. They know Whitlock heaters can be depended on to give the correct temperature and viscosity conditions for best fuel utilization.

Whatever your fuel oil heating requirements, Whitlock can supply a heater that combines the best in thermal and mechanical qualities to meet your needs and give long, trouble-free service. Both standardized and "tailor-made" heaters are available in a wide range of capacities and constructions. Ask Whitlock engineers for recommendations. For complete information and Bulletin 35, address The Whitlock Manufacturing Co., 44 South St., Hartford 10, Conn.

New York • Boston • Chicago • Philadelphia
Detroit • Richmond

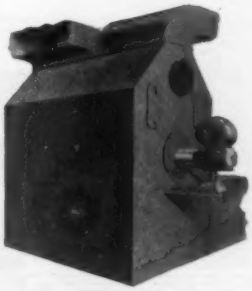
Authorized Representatives in Other Principal Cities
In Canada: Darling Brothers, Ltd., Montreal
Established 1891—Ahead of the Times for Half a Century

WHITLOCK HEATERS

NATIONAL CHAMPION

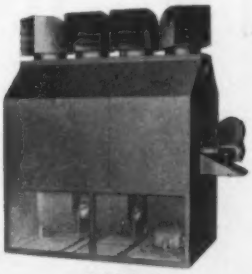
OIL, GAS AND STOKER FIRED HEAVY DUTY STEEL HEATERS

AVAILABLE
WITH OR WITHOUT
INDUCED DRAFT BLOWERS



MODEL D
200,000 TO 1,500,000 BTU

900 SERIES
400,000 TO 2,000,000 BTU



MODEL H
200,000 TO 1,500,000 BTU

Ideal for:

AUDITORIUMS	CHURCHES
DRIERS	FACTORIES
GARAGES	HANGARS
OFFICES	SCHOOLS
THEATERS	WAREHOUSES

NATIONAL HEATER COMPANY

2180 CLEORA AVE. ST. PAUL 4, MINNESOTA

preparing for a licensing examination to practice professional engineering.

These notes, says the author, attempt to screen out superfluous material and expose the aspirant to a comprehensive collection of selected sample problems compiled from past examinations, together with their solutions.

The section on hydraulics deals with hydrostatics, hydrodynamics, circular orifices, sharp crested weirs, flow through pipes, flow in open channels, and centrifugal pumps. The section on thermodynamics and heat covers the behavior of gases and vapors, processes of gases, compression and expansion of air, liquids and vapors, flow of gases and vapors through orifices and nozzles, fuels and combustion, the steam power plant, vapor cycles, reciprocating steam engines and turbines, refrigeration, the flow of heat, and psychrometry. The section on machine design includes discussions of springs, belt transmission, gearing, lubrication, bearings, etc.

These notes are reproduced in book form by the photo-offset process from hand lettered material. The notes were prepared in 1948 and were revised and expanded in 1949. Copies of the new third edition may be obtained from the author at 625 Hudson Terrace, Cliffside Park, N. J. for $4.50.

Other Books and Reports Received

HEAT TRANSFER TO A FLUID FLOWING TURBULENTLY IN A SMOOTH PIPE WITH WALLS AT CONSTANT TEMPERATURE, by R. A. Seban and T. T. Shimazaki, mechanical engineering department, University of California—This paper presents results comparing heat transfer coefficients as obtained under conditions of constant wall temperature and linear variation of wall temperature, and it is shown that for fluids of low Prandtl number the effect of the wall temperature profile is significant. Because of the length of the calculations, the results are presented only for flow in a smooth circular pipe. According to the authors, heat transfer coefficients for fluids of Prandtl numbers less than 1.0 have been shown (for this case) to be significantly different from the case of constant heat rates as presented by Martinelli. The Nusselt numbers obtained for the case considered can be obtained with an accuracy of ±6 percent from an empirical equation. Identified as No. 50-A-128, this paper was presented at the recent annual meeting of the American Society of Mechanical Engineers, 29 E. 39th St., New York 18.

HEAT TRANSFER COEFFICIENTS IN HORIZONTAL TUBE EVAPORATORS, by W. L. Bryan and G. W. Quaint, Case Institute of Technology—Data are presented to show the pressure drop and heat transfer rates which occur when "Freon-11" evaporates inside a smooth horizontal tube with and without a turbulence promoter installed. A correlation of heat transfer vs. pressure drop is presented for these data as well as for previously published data for "Freon-12" and water.

This paper is the result of research sponsored by the American Society of Refrigerating Engineers, 40 W. 40th St., New York 18, and was presented at its recent annual meeting.

"The FRICK Unit Air Conditioner Saved Our Candies"
Says Hupper's Confectionery at Lancaster, Penna.
Here a 5-hp. Frick unit cools a room measuring 53 by 23 feet, protecting a large display of chocolates, and keeping customers comfortable. Installation by Marr Engineering Co., Frick Distributors at Reading, Penna.
There's a Frick air conditioning system to suit the exact needs of your business. Write now for literature and estimate.
DEPENDABLE REFRIGERATION SINCE 1883
FRICK CO.
WAYNESBORO, PENNA. U.S.A.
Also Builders of Power Farming and Sawmill Machinery

. . . when you install

TRANSITE INDUSTRIAL VENT PIPE

IF YOU HAVE a tough venting problem, the chances are good that you can solve it with Transite* Industrial Vent Pipe.

That's because this durable asbestos-cement product has proved in many installations that it can successfully resist many of the corrosive fumes, vapors, dusts and gases encountered in industrial venting operations. Its unusual chemical stability may help you realize important savings in plant maintenance . . . help you avoid frequent, costly replacements in your venting system.

Moreover, because Transite Industrial Vent Pipe is non-metallic and therefore rust-proof, it needs no painting or other protective treatment. Highly weather-resistant, it can be used for either indoor or outdoor service. A complete range of sizes up to 36" in diameter, with a complete line of rustproof, corrosion-resistant Transite fittings, adapts it to practically any job requirement. It is light in weight and can be readily cut and drilled with ordinary tools.

For further information address Johns-Manville, Box 290, New York 16, N. Y. In Canada, 199 Bay Street, Toronto, Ontario. Ask for Data Sheet Series DS-336.

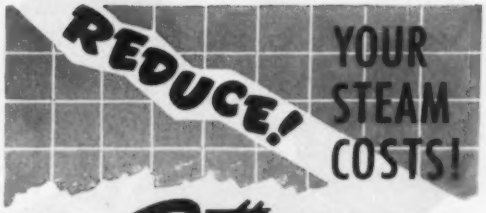
JM

*Transite is a Johns-Manville registered trade mark

Typical Industries in which Transite Industrial Vent Pipe is used:

Aircraft	Foundry	Pulp & Paper
Automobile	Furnace	Quarrying
Baking	Furniture	Railroad
Bleaching	Gas	Rayon
Boiler Works	Glass	Refrigeration
Brewing	Laboratory	Rubber
Canning	Laundry	Shipbuilding
Ceramic	Leather	Shoe
Chemical	Match	Smelting
Dairy	Meat Packing	Soap
Drug	Metal	Soft Drink
Electrical	Mining	Sugar Refining
Explosives	Paint	Textile
Farm Machinery	Petroleum	Tool
Food	Potash	Water & Sewage

Johns-Manville
TRANSITE Industrial Vent PIPE

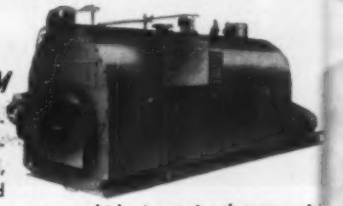


WITH A Dutton "PACKAGED"

STEAM GENERATOR

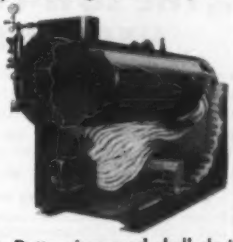
Dutton Steam Generators are QUALITY PRODUCTS, incorporating exclusive features of LONG LIFE, LOW OPERATING AND MAINTENANCE COST, MAXIMUM EFFICIENCY and SAFETY that only 71 years experience in boiler making can produce. Dutton Automatic "Packaged" Steam Generators are completely assembled — no special foundation or expensive chimney are needed.

Dutton EconoTHERM



Completely self-contained, automatically operated, 3-pass modified Scotch Internal Furnace type which gives twice the power in half the usual space. Features such as the Dutton Off-Center Firing and Rotary Combustion assure faster steam and more steam with less fuel consumption and greater safety. Burns gas or oil.

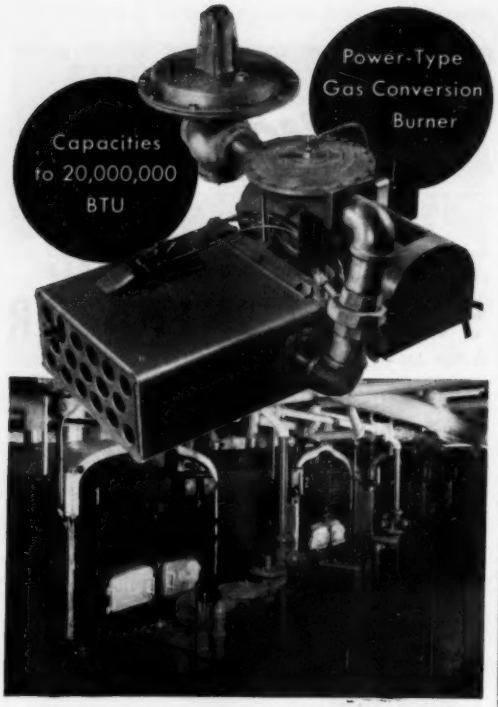
Dutton EconoMIST



A highly efficient horizontal return tube type, assembled in portable casing and ready for firing on arrival. Dutton improved shell design and double size full length, high bricked firebox, give faster steaming and longer steam carry-over with less fuel consumption. Burns oil, gas or coal with high efficiency — easily converted from one fuel to another. Available as a package unit with firing equipment, controls and mechanical draft with short stack.

Let us help select the best type for you.
Write for catalog HP-351 on "Packaged" STEAM GENERATORS.

Dutton BOILER DIVISION
HAPMAN-DUTTON COMPANY
KALAMAZOO • MICHIGAN
Boiler Makers Since 1880



LO-BLAST

...THE LOW-COST WAY TO HEAT WITH GAS!

Years of actual operation conclusively prove the Lo-BLAST principle of power-burner design to be exceptionally efficient and free from service troubles . . . operating records show an average saving of 10%! That's why utility companies and consulting engineers give unqualified approval of the Lo-BLAST Burner.

Compare these operating and construction features!

1. Power burner combustion—independent of variable natural draft within the furnace—perfectly controlled primary and secondary air at all times.
2. Combustion completed in incandescent fire box—radiant heat applied to crown sheet as well as side walls.
3. Soft, quiet flame—no combustion roar.
4. Standard controls with positive acting pilot and blower safetys.
5. Foolproof design prevents shut-downs and service costs.
6. Package job, factory tested on gas, shipped completely assembled. Simple to install.
7. Nothing in the fire box but the fire.
8. Attractively priced for competitive selling.

THE ECONOMITE
Residential size burner with all the famous design features of Lo-BLAST Burners.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

MEETINGS & CONVENTIONS

I-B-R SCHOOL OF MODERN HEATING, sponsored by the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17.—This is a traveling school designed to provide an intensive three-day training in heating design and installation. Classes will be held this month in Baltimore, Raleigh, N. C., and Charlotte, N. C., and a class is scheduled for next month in Atlanta, Ga. Additional information may be obtained from the institute.

INTERNATIONAL INDUSTRIAL EXPOSITION—March 11 through 17, the Coliseum, Houston, Tex. According to the exposition management, located at 41 San Jacinto St., Houston 2, exhibits will cover oil, refining, chemicals, metals, machinery, power, material handling, welding, instruments, etc.

Free admission tickets will be sent to members of many engineering societies and other organizations, including the American Society of Heating and Ventilating Engineers, the American Society of Mechanical Engineers, and the American Welding Society.

HEATING SHORT COURSE—An "engineering institute", on the pattern of a short course, will be held at the University of Wisconsin, March 13 to 15, and will cover warm air heating and air conditioning. Enrollment is limited and additional information may be obtained from Prof. H. E. Pulver, University Extension Division, Madison, Wis.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 919 Milam Bldg., Houston, Tex.—The 1951 conference and exhibition will be held at the Hotel Statler, New York City, March 13 to 16, and plans are now completed for the presentation of 39 technical papers to be presented at various symposia dealing with the water industry, pipe lines, boiler feedwater, the chemical industry, protective coatings, cathodic protection and industrial uses of corrosion inhibitors. Round table sessions will deal with general corrosion problems and also pipe line and underground corrosion.

INSTRUMENTATION CONFERENCE FOR THE IRON AND STEEL INDUSTRY—Sponsored by the Pittsburgh section of the Instrument Society of America, a two-day conference will be held in Pittsburgh on March 28 and 29. Cooperating with the sponsoring organization will be the local chapters of various engineering societies. Further information may be obtained from the general chairman, L. M. Susany, Carnegie Library, 4400 Forbes St., Pittsburgh.

THE 19th NATIONAL OIL HEAT EXPOSITION and 28th annual convention of the *OIL-HEAT INSTITUTE OF AMERICA*, 6 East 39th St., New York 16—These affairs will be held April 2 to 6 in Chicago. The exposition will be held at Navy Pier and business sessions of the meeting will be conducted at the Palmer House.

14th MIDWEST POWER CONFERENCE, April 4 to 6, the Sherman Hotel, Chicago. The affair is sponsored by the Illinois Institute of Technology and 18 midwestern universities and professional societies and is devoted to

Send for This Useful Reprint Volume

"CORRECT PRACTICE in INDUSTRIAL PIPING"

197 Pages — 8½" x 11" — $1.50

This practical book is made up of outstanding papers and data on industrial piping selected from past issues of "Heating, Piping & Air Conditioning." It is a most comprehensive collection of case studies, showing how various difficult piping problems encountered in different industrial plants were successfully worked out by piping experts.

Design, installation, operation, and maintenance . . . steam, air, gas, oil, process, water and refrigeration piping . . . piping in pulp and paper and steel mills, in automobile plants and breweries, in the food and chemical and textile industries, and in many other types of manufacturing plants are dealt with from many different angles.

Send $1.50 today for this book to the address below.

KEENEY PUBLISHING COMPANY

6 North Michigan Ave. Chicago 2, Illinois

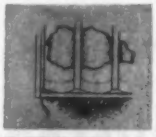
when you figure COST, EFFICIENCY and OPERATION

DUSTUBES

are the FEATURE VALUE

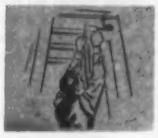
Reasonable initial cost — high efficiency that licks your dust problem — low cost operation and maintenance — are just a few of the advantages offered you by Dustube's exclusive features.

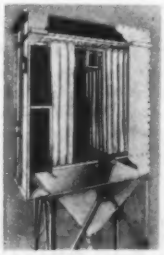
Dustube performance meets the most exacting requirements. Efficiencies of 99.5% and higher by weight are regularly obtained.



Dustube design means low-cost operation. Low pressure drop across the cloth tubes. Simplified shaker system quickly frees the tubes of accumulated dust resulting in power savings.

Dustube maintenance is easy. It has but few working parts and requires but little maintenance. One man can replace a tube using only his hands. All inspections and replacements made from clean air side.





Feature by feature Dustube proves its advantages. Figure everything, and you will agree that Dustube is the feature value. There is a size and model available for every application.

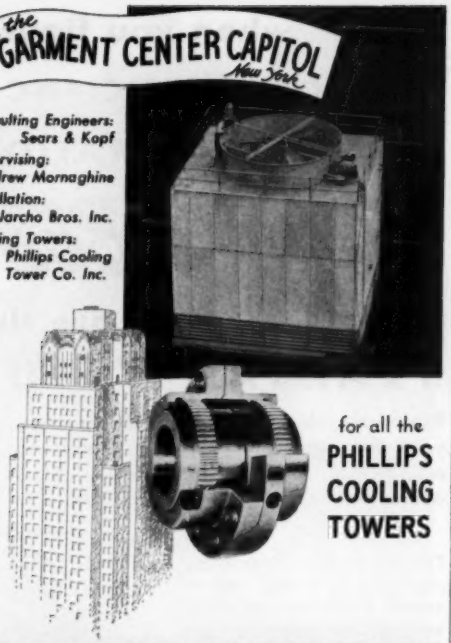
For a complete description of the mechanical features and many advantages which make Dustube a better value, write for free literature.

American WHEELABRATOR & EQUIPMENT CORP.
619 S. Byrkit St., Mishawaka 4, Ind.

dustube COLLECTORS

At the GARMENT CENTER CAPITOL New York

Consulting Engineers: Sears & Kopf
Supervising: Andrew Mornaghine
Installation: Jarcho Bros. Inc.
Cooling Towers: Phillips Cooling Tower Co. Inc.

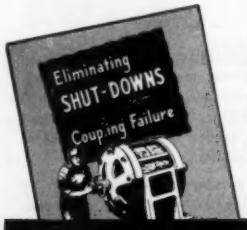


for all the PHILLIPS COOLING TOWERS

WALDRON COUPLINGS
Floating Shaft Type

The most exacting problems of remote drives and excessive misalignments are met in the construction and operation of a modern cooling tower. It is therefore significant that the WALDRON Floating Shaft Type Coupling is in such wide use by leading cooling tower builders.

At the new Garment Center Capitol Building in New York, all three of the Phillips Cooling Towers installed are equipped with these WALDRON couplings to insure dependable operation on the critical drives where coupling failure could prove so damaging.



Write for your copy of this new folder which explains in detail the coupling features which provide added insurance against coupling failure. Useful information for every coupling user. Copy will be sent promptly on request.

JOHN WALDRON CORP.
Main Office and Works
New Brunswick, New Jersey
COUPLINGS

Sales Representatives in Principal Cities.

the production, transmission and distribution of power. Secretary of the conference is Edwin R. Whitehead, director of the department of electrical engineering at Illinois Tech, Technology Center, Chicago 16, Ill.

The program will consist of 26 technical and general interest sessions, three luncheons and an all-engineers' dinner. Among the technical sessions, which will be devoted to subjects covering all phases of the power industry, will be a symposium on organic water treatment materials, a session on fuels and combustion, one on fly ash, and another on residential applications of electric power heating and hot water supply. During the heat pump session, a paper will be given on the influence of freezing on heat pump ground coil capacity, by A. D. Kafadar and I. B. Fieldhouse, research engineers, Armour Research Foundation, and R. A. Budenholzer, professor of mechanical engineering, Illinois Institute of Technology. Other papers scheduled for presentation at the conference include:

Recent Studies in Cooling Tower Wood Deterioration, by D. R. Baker, engineering research division, Marley Co.

Equipment for Treatment of Makeup of Cooling Towers, by Durando Miller, Permutit Co.

Meeting the Soda Ash Shortage by Conversion of Filters to Zeolite Softeners, by George H. Kraf, Power and Fuel Engineer, Carnegie Illinois Steel Corp.

Feedwater Treatment in the Packing Plant, by M. B. Golber, power plant engineer, Armour and Co.

AMERICAN FOUNDRYMEN'S SOCIETY, 616 S. Michigan Ave., Chicago 5—The 55th annual convention will be held in Buffalo, N. Y., April 23 to 26.

MATERIALS HANDLING EXPOSITION—International Amphitheater, Chicago, April 30 to May 4. Industries which will be given special attention in exhibits include paint and varnish, oil, chemicals, and food processing. Simultaneously with the show, which is sponsored by the Material Handling Institute, a three-day conference will be conducted by the American Material Handling Society. Additional information may be obtained from the show manager, Clapp and Poliak, Inc., 341 Madison Ave., New York 17.

AIR POLLUTION AND SMOKE PREVENTION ASSOCIATION OF AMERICA—The 1951 annual meeting will be held May 6 to 10, Roanoke, Va.

HEATING, PIPING & AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, 1250 Avenue of the Americas, New York 20—The 62nd annual convention, Washington, D. C., May 8 to 11.

AMERICAN INSTITUTE OF ARCHITECTS, Washington 6, D. C.—The 1951 convention and national seminar meetings will be held May 8 to 11, Edgewater Beach hotel, Chicago. For the first time in 83 years a product exhibition will be held in conjunction with the affair. According to the institute, only those building products or methods recently placed in production or shortly to be offered commercially will be granted space.

ENGINEERING INDUSTRIES EXHIBITION—To be held in conjunction with the silver anniversary convention of the New York State Society of Professional Engineers, May 10 to 12, Hotel Statler, New York City. Additional

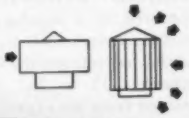
do you know

the TRUTH about ventilators?

Ventilators are usually selected on the basis of their *capacity ratings*. That makes sense, but do you know that:

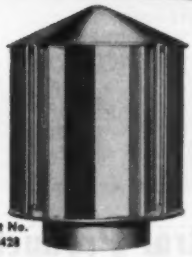
1. Capacity ratings of most ventilators are *not* certified.

2. Capacity ratings of most ventilators are based on *horizontal* wind tests only.



Breidert Air-X-Hausters

provide safe, sure ventilation no matter which way the wind blows!

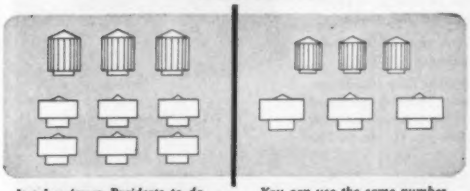


Patent No. 2269428

and . . . Breidert Air-X-Hausters are the *only* ventilators with published certified capacity ratings based on tests* made with wind blowing in *all* directions as shown above.

Only such tests can guarantee the capacities a ventilator will deliver under actual operating conditions. No matter which way the wind blows, barring interior negative pressures, the Breidert provides safe, sure ventilation . . . on roofs, vent flues, chimney tops. Stationary, no moving parts, nothing to jam or get out of order.

HOW YOU CAN GET BETTER RESULTS WITH LESS MONEY



It takes fewer Breiderts to do the job as same size conventional ventilators.

(or)

You can use the same number of smaller size Breiderts to do the same job as conventional ventilators.

Get *all* the facts! Write today for complete Engineering Data Book, including certified capacity ratings. Address Dep't A.

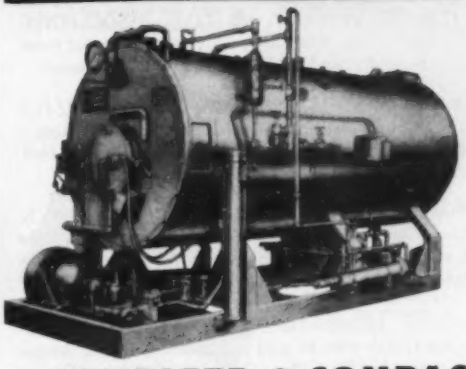
**By Pittsburgh Testing Laboratories*

THE G. C. BREIDERT CO.

3129 San Fernando Road, Los Angeles 65, Calif.

Representatives in principal cities throughout the U.S.

MODERNIZE with the AMESTEAM GENERATOR



• COMPLETE • COMPACT

• ACCESSIBLE • EFFICIENT

• AUTOMATIC

10 to 500 h. p. —
15 to 200 lbs. capacities

Here are the facts!

WRITE FOR YOUR COPY

AMES IRON WORKS

BOX 2003 OSWEGO, N. Y.

Builders of Better Boilers since 1848

Manufactured under License in Canada by VOLCANO, Ltd., Montreal, P. Q.

information may be obtained from the chairman of the society's exposition committee, 1941 Grand Central Terminal, New York 17.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 40 W. 40th St., New York 18—The 38th spring meeting will be held at the Hotel Statler, Detroit, May 27 to 30.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—The 42nd annual meeting will be held June 5 to 8 at the Statler hotel, Detroit.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia—This year's annual meeting is scheduled for June 18 to 22 at Chalfonte-Haddon Hall, Atlantic City.

STOKER MANUFACTURERS ASSOCIATION, 307 N. Michigan Ave., Chicago 1—The annual meeting will be held at the South Shore Inn, Lake Wawasee, Syracuse, Indiana, on June 25 and 26.

EIGHTH INTERNATIONAL CONGRESS OF REFRIGERATION—To be held in London, England, August 29 to September 11. Maurice Piettre, 9 Avenue Carnot, Paris, France, is secretary of the International Institute of Refrigeration, which is planning the affair.

INTERNATIONAL DISCUSSION OF HEAT TRANSFER—Postwar heat transfer developments will be the theme of a meeting, September 11 to 13, London, England. Plans for participation by engineers in the western hemisphere are being arranged by a joint committee on North American participation, which consists of representatives from some 12 professional and engineering societies. The American Society of Mechanical Engineers is coordinating administrative details. Participation by British and European engineers is being coordinated by the Institution of Mechanical Engineers.

BRITISH BUILDING RESEARCH CONGRESS—Sponsored by a number of professional institutions and societies, government departments, and representative industrial federations, the congress will be held in London, September 11 to 20. Additional information may be obtained from the organizing secretary, Building Research Congress 1951, Buiding Research Station, Bucknalls Lane, Garston, Watford, Herts, England.

Among the papers to be presented during the heating and ventilating sessions is one on heat transfer, by Prof. C. O. Mackey, Cornell University, and one on radiant heating by Prof. F. W. Hutchinson, University of California.

THE 7th ALL-INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION, to be held at Navy Pier, Chicago, November 5 to 8. The affair is sponsored by the Refrigeration Equipment Manufacturers Association, 1346 Connecticut Ave., Washington 6, D.C.

Sterlco Heating and Temperature Control Products

Heating Specialties

¼" 69-B Float and Thermostatic Trap.

Thermostatic Traps: ½" to 1" sizes; low, medium, high pressure; wide variety of body styles.

Float and Thermostatic Traps: ¾" to 2" sizes; low and high pressure.

Strainers: ⅜" to 2" sizes; cast iron or brass bodies. Also *Radiator Valves, Vents, Boiler Return Traps.*

Temperature Control Valves

120-A Thermotrol Individual Radiator Temperature Control.

No. 120 Thermotrol: Self-contained individual radiator temperature control for steam or hot water. Easily installed in place of manual radiator valve. Sizes ½" to 1"; all body styles.

Tank Temperature Controls: Self-powered modulating control valves for fluid heaters and all types of process equipment for heating or cooling. Sizes ⅜" to 2".

Condensation and Vacuum Pumps

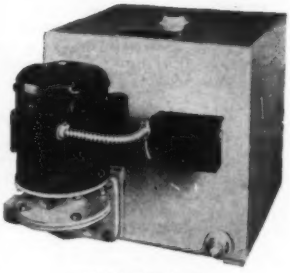
4100 Series: Compact, economical condensation pumps with 15 or 30 gallon steel tank, dual voltage capacitor type motor, rotary seal, and simple, sturdy vertical centrifugal pump. For all low pressure jobs up to 14,000 sq. ft. E.D.R. and 20 lbs. pressure.

4200 Series: Same as 4100 Series except cast iron tanks.

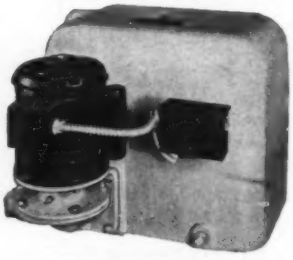
3500 Series: Heavy duty condensation pumps with pedestal mounted steel tank, for a wide range of jobs — 2000 to 65,000 sq. ft., up to 150 lbs. pressure.

3700 Series: Condensation pumps with heavy cast iron tank for installation underground or in wet locations, 2,000 to 20,000 sq. ft., 20 or 30 lbs. pressure.

Vacuum Pumps: Type V, 2500 and 5000 sq. ft., 20 lbs. pressure. Type S, 10,000 to 40,000 sq. ft., 20 to 40 lbs. pressure.



4126-B Condensation Pump (Steel Tank)



4226-B Condensation Pump (Cast Iron Tank)

Descriptive bulletins with complete specifications of any of the above products will be furnished promptly upon request.

Distributed through Leading Heating and Plumbing Wholesalers
Sales Representatives in Principal Cities

STERLING, INC. 3732 N. Holton Street Milwaukee 12, Wisconsin

only with WILSON HAIR FILTERS
can you guarantee these exclusive features...

1. **15% to 50% Greater Trificiency***
   - *(a) Greater Dust-Catching Efficiency
   - *(b) Maximum Air-Flow Efficiency
   - *(c) Maximum Dust-Holding Capacity
2. **Full-Depth Dust Trapping**
3. **Cleaning Without Clogging**
4. **More Cleaned Air Per Filter**

And—*the reason* is so obvious—it's the *hair* that cleans the air, so easily, so effectively, so economically. Mother Nature knew the answer, when she placed Hair (the ideal air filtering medium) in the nostrils of all mankind, as an essential part of the human air-filtering system.

WILSON & CO., INC.
(Air Filter Division), 4100 South Ashland Ave., Chicago 9, Ill.

Wilson Hair Filters are another quality product of Wilson & Co., Inc., world-famous for meat products, sports equipment, pharmaceuticals, hair products, etc.

The famous Edgeseal, the original *Hair* Filter with the patented self-sealing edge.

The popular Honeycomb, the dressed up *Hair* Filter that is so easy to handle.

Save delay. Save dollars. Save doubt. Send for FREE sample with details and prices.

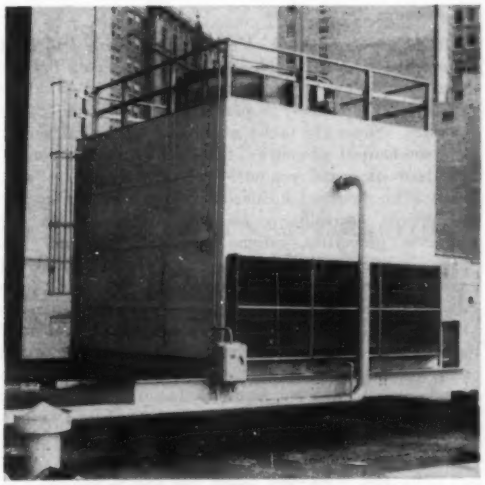
INDOOR COMFORT

WILSON'S **HAIR** FILTER

WILSON & CO

UNITED Builds A COMPLETE LINE OF COOLING TOWERS

for Refrigeration and Air Conditioning



450 ton United Tower in commercial air conditioning service. Transite sheathed; deck filled; low pressure sprinkler distribution.

Individually designed and constructed mechanical draft equipment in any required capacity.

Standardized, prefabricated, easily assembled "package" type spray towers for 5 to 30 tons refrigeration.

Bulletin No. 50 shows typical United installations in all fields . . . power, oil, gas and refrigeration . . . gives full details of design and construction features. Write for it today.

UNITED COOLING TOWER COMPANY

Porter Bldg. — *Authorized Representatives in Principal Cities* — *Kansas City 2, Missouri*

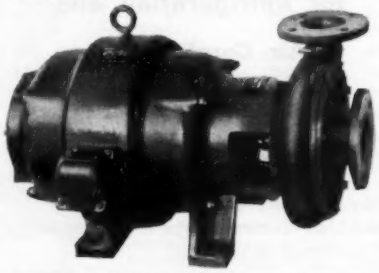
know the nicest guy in the world who's

ALWAYS LOOKING FOR TROUBLE

YOUR WEINMAN REPRESENTATIVE...

. . . definitely no trouble maker, but trouble *is* his business. Any plant with liquid handling difficulties needs his advice and his product. He sells Centrifugal Pumps but he offers much more than that. He offers specialized experience. The organization backing him has concentrated on ONE product for more than half a century. Each pump application and installation is custom-made for the job to be done. Thousands of WEINMAN pumps are successfully preventing trouble today.

Why not talk Pumps with WEINMAN? WEINMAN'S knowledge will save you money and worry. The WEINMAN representative is ready to talk facts and figures whenever, wherever you say. Just write, wire or phone.



WEINMAN General Service Unipump is compact enough to be used where space is limited. It is sturdy and operates economically. Works against heads up to 500 feet. Capacity up to 1000 G.P.M.

REPRESENTATIVES IN PRINCIPAL CITIES

Built by Centrifugal Specialists

The WEINMAN Pump Mfg. Co.

284 Spruce Street • Columbus 8 • Ohio

RECENT TRADE LITERATURE

For your convenience in obtaining copies of these bulletins, see coupon on page 213. If you write direct to the manufacturer, describe carefully what literature you want, as the number given first in each item is for use only when sending requests to Heating, Piping & Air Conditioning.

Air Conditioning Units

HPAC 101—Packaged "Kooler-aire" air conditioning units in sizes from 3 to 40 tons are described and illustrated in a new booklet issued by United States Air Conditioning Corp., 3300 Como Ave., S. E., Minneapolis 14. Designed to illustrate graphically the features of the unit, the booklet opens outward to reveal a sectionally-cut picture of the equipment's interior. Parts of the booklet depicting the unit's basic components also open separately to reveal a description of each section. The remainder of the booklet provides installation diagrams and instructions, general specifications and capacities, a breakdown of parts, and instructions for adaptation to perform an added heating function.

Aluminum Coated Steel

HPAC 102—"Aluminized" steel — steel with a special coating of aluminum — is discussed in a new 24 page booklet prepared by Armco Steel Corp., Middletown, Ohio. Information is given on the aluminum surface and its heat and corrosion resistance. Photographs and a listing of applications show where manufacturers have used this material in a wide variety of products. Also included are data on mechanical and forming properties, available sizes and gages, as well as detailed recommendations for welding by various methods.

Aluminum Data Book

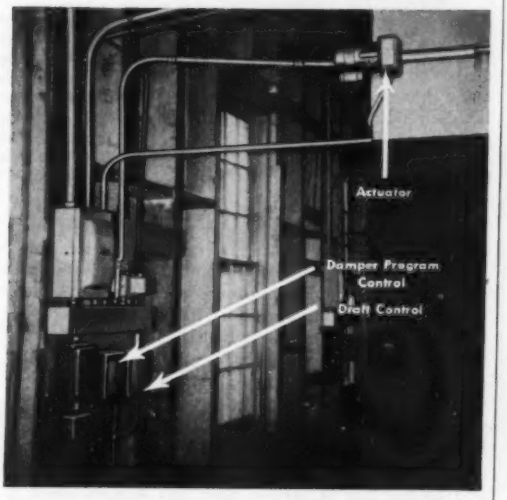
HPAC 103—Reynolds Metals Co., 2500 S. Third St., Louisville, Ky., has published a 194 page data book on aluminum alloys. Information is given as to alloys, tempers, sizes, shapes, properties, and fabricating characteristics. Some 117 tables of data on physical, chemical, and mechanical properties, standard tolerances, weights, standard sizes and production limits, as well as much fabricating data, are included. Information is also given on relative corrosion resistance, elevated and low temperature properties, fatigue strengths, minimum bend radii, joining methods, finishes for aluminum, etc. In addition, there are 38 pages of explanatory text covering a wide range of related subjects such as the alloy designation system, the temper designation system, heat-treatable and non-heat-treatable alloys, casting alloys, casting methods, and foundry practice. Wrought aluminum mill products are detailed and manfacturing methods are described. Distribution of this book is limited, and requests for copies should be forwarded directly to the manufacturer on your company letterhead.

Ammeters

HPAC 104—The "Tong Test" ammeter of Columbia Electric Mfg. Co., 4519 Hamilton Ave., N. E., Cleveland 14, may be used to measure current in both a-c and d-c

PERFEX

INDUSTRIAL CONTROLS AT SALINA AIR BASE



Nine sets of Perfex Industrial Controls were purchased for the Salina Air Base at Salina, Kansas, to...

- √ conserve fuel
- √ improve burner adjustments
- √ lengthen equipment life
- √ save operator's time
- √ increase efficiency
- √ save money

SEND TODAY FOR *NEW* BULLETINS!

Complete diagrams, layouts and data on Perfex Draft Control Systems. Ask for bulletin

No. 5—gas firing

No. 6—oil firing

No. 7—stoker firing

PERFEX

CONTROLS YOU CAN TRUST

PERFEX CORPORATION, MILWAUKEE, WISCONSIN

In Canada, Perfex Controls, Ltd., Toronto 1, Canada

EAGAN "EAGLE"

CONDENSATE PUMP

MATCH THIS FOR VALUE!

Here's the best condensate pump "buy" on today's market. It provides far more capacity than any similar pump . . . 8,000 sq. ft. EDR at 20 PSI . . . and it's only **$139.00** (trade price). F.O.B. Phila.

Compare These Six Features

Mail coupon for full details

- **Low inlet, 2" IPS, 12" from floor**
- **All bronze centrifugal pump**
- **Flexible coupling**
- **Standard ¼ HP capacitor motor**
- **Thermal overload protection**
- **Level indicating 2 pole float switch**

WALTER H. EAGAN CO., INC.

Mfgs. of Condensate, Vacuum, Turbine, Boiler Feed and Centrifugal Pumps.
Pump Specialists since 1920

WALTER H. EAGAN CO., Inc. (Dept. B)
2336 Fairmount Avenue
Philadelphia 30, Pa.

SEND ME FREE DESCRIPTIVE BULLETIN OF THE NEW EAGAN "EAGLE" CONDENSATE PUMP

NAME .....

COMPANY .....

STREET .....

CITY ..... **Zone**.... **State**.....

Low Cost
Fast Work
Leakproof
Permanent

IT'S THIS EXCLUSIVE
RECESSED
BRASS SEAT
that means
JOINTS THAT
STAY TIGHT!

. . . when you use
JEFFERSON
SPECIALTY UNIONS

*Made from malleable iron with tensile strength of 55,000 lbs. per sq. in.—they won't fail.

*Rings are cut from a special brass tubing—they're *not* cast.

*Ring channels are *machined* rather than cast—no rocking of the seat.

*All Jefferson Unions are air tested for leakage before shipment.

These are just a few of the reasons why you should investigate our unions for your piping assemblies. We're sure you'll find them to be the solution to your piping problems.

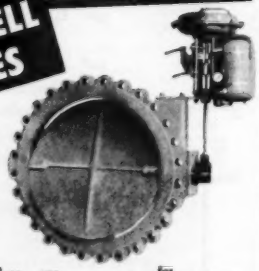
JEFFERSON UNION CO.
607 West 26th Street, New York 1, N. Y.

35 Fletcher Avenue
Lexington 73, Mass.

65 Gooding Street
Lockport, N. Y.

Get Easy Control . . Quick Shut-Off
of Air • Gas • Steam • Liquids • Solids

ROCKWELL
VALVES



Rockwell Valves are rugged, compact; give full flow area, with minimum pressure drop; provide excellent commercial tightness; easy to clean. Made of any suitable metal or rubber-covered for pressures to 60 p.s.i. Equipped with any type manual control or motor, hydraulic, air diaphragm or float type automatic control. Slide Valves available in pipe sizes to 24"; Butterfly Valves in sizes from 1" to 84".

For
- Low pressure steam for processing equipment.
- Cooling water for compressors.
- Overflow tanks, draining humidifiers, etc.
- Flue gases for feed water heaters.
- Air supply from blowers; air supply and forced draft for combustion equipment.
- Air flow in dust collecting systems.
- Shut-off for ventilating systems.
- Warm air and sheet metal applications.

Write for our
Valve Catalog

W. S. ROCKWELL COMPANY
254 ELIOT STREET FAIRFIELD CONN.

lines. Readings are taken by snapping the tongs around the electrical conductor. It is not necessary to break the circuit or insulation. Detailed information is given in a new eight page bulletin which also gives information on the "Voltor" attachment for measuring voltage.

Bending Machines

HPAC 105—The new 32 page bulletin of O'Neil-Irwin Mfg. Co., Lake City, Minn., not only covers the company's line of "Di-Acro" benders, but contains a good deal of basic information which is applicable to any rotary type bending machine. Descriptive material and illustrations cover numerous bending operations, such as centered eye, off center eye, circle, zero radius, scroll, square, spring and coil, loop, spiral, and edgewise bending. Also covered is tube bending by the roller method and by the follow block method.

Boiler Controls

HPAC 106—A new bulletin (SLC-2-F) covering all of the various types of boiler controls manufactured by Penn Electric Switch Co., Goshen, Ind., is now off the press. This eight page booklet covers controls for temperature, pressure and vapor applications and gives complete ordering specifications for all of the basic types of controls manufactured. Specifications include type designations, application information, temperature element and connector sizes, electrical specifications, and roughing-in dimensions.

Carbon, Alloy and Stainless Steel Pipe

HPAC 107—A new data card (TDC 138) on seamless and welded pipe of carbon, alloy and stainless steels is offered by Babcock & Wilcox Tube Co., Beaver Falls, Pa. Table 1 lists dimensions of 16 sizes of pipe from ⅛ in. to 8 in. nominal size, with five different weight schedules according to wall thickness and inside diameter. Table 2 gives ASTM and ASME specifications with grades and analyses for various types of pipe for high temperature and other services.

Combustion Controls

HPAC 108—Hays Corp., Michigan City, Ind., has prepared five case histories on combustion control. Each is a report on the experience of one company with the firm's combustion control equipment. Information given includes the problems which faced boiler plant personnel before installing the control equipment, the specific conditions which exist in the plant, how the new control system operates, and the results obtained with automatically controlled combustion. Schematic drawings and photographs are included in each report.

Convectors

HPAC 109—Young Radiator Co., Racine, Wis., has issued Catalog 4150 on its line of low-level convectors for hot water and two pipe steam heating systems. This eight page, two color booklet is a supplement to Catalog No. 4048 which gives details on the firm's general line of convectors.

Corrosion Resistant Linings

HPAC 110—Bulletin 4-1 of Atlas Mineral Products Co., 42 Walnut St., Mertztown, Pa., describes the com-

MASSACHUSETTS
Power Fixed and Squirrel Cage
FANS

POWER FIXED FANS

Backward curve blade type with non-overloading characteristics. Housings constructed of steel plate and reinforced with heavy bracing angles. Wheel sizes Single Width 13½" x to 86½" dia. Double Width 18" to 86½" dia. Class I or Class II construction for better fan selection.

SQUIRREL CAGE FANS

Fan wheels have low speed characteristics. The low air velocities permitted are conducive to efficient operation. Housings are rugged and compact. Wheel sizes Single Width 13½" to 86½" dia. Double Width 18" to 86½" dia.

Housing shown above for 86½" wheel

Write for catalogs.

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE CLEVELAND 14, OHIO

Easier TO BUY TO SELL TO INSTALL

ALDRICH Packaged BOILER-BURNERS

Here are compact, complete, packaged boiler-burner units in sizes for home and industry, for low-pressure steam and hot water heating and/or hot water supply. All are oil-gas interchangeable. They're economical to buy and use, easy to install in minimum space with a minimum of skilled labor. Write for information.

UNIQUE NEW "BANTAM," rated at 100,000 BTU per hour is especially designed and priced for modern low-cost homes, 45 in. high; occupies 20 x 33 in. floor space. Provides heat and domestic hot water in excess of FHA requirements.

SERIES "B" Heat-Pak Units give dependable, efficient performance on all types of steam or hot water heating systems. Six sizes 118,000 to 808,000 BTU. Ideal for residences, commercial and industrial establishments. All Aldrich Boiler Burners also available for hot water supply only.

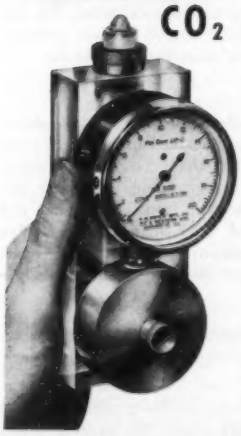
ALDRICH
ALDRICH COMPANY
105 East Williams St., Wyoming, Ill.
Subsidiary of Breeze Corporations, Inc.

JOBBERS: You'll make more money with Aldrich—write for facts about Aldrich Boiler Burner Units and Aldrich precision built oil burners; models from .75 to 19 GPH. **DEALERS:** Write for name of nearest jobber.

ANOTHER PRODUCT

Only 20 Seconds for a Complete Test!

The NEW DWYER TRANSPARENT
CO_2 INDICATOR

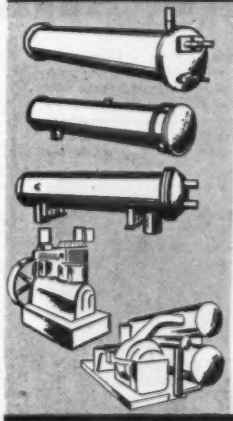


The Dwyer s900 is a really new CO_2 Indicator that assures greater efficiency and accuracy in operation. It actually takes but 20 seconds to make a complete test—and you can make over 500 tests per refill. Body is fabricated from a transparent solid "lucite" bar, making it practically unbreakable. Open-faced dial is easy to read. Furnished with a circular efficiency slide rule. Available in heavy metal case with provision for stack thermometer, draft gage and smoke tester.

Also manufacturers of Draft Gages, Smoke Detectors, Manometers, Pitot Tubes, etc.

F. W. Dwyer Mfg. Co.
323 South Western Avenue Chicago 12, Ill.

QUICK - PROMPT
RETUBING SERVICE



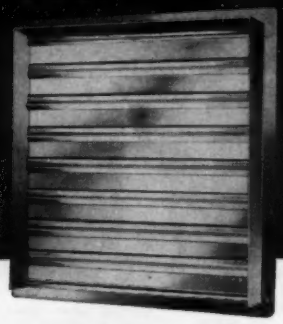
on
FREON - AMMONIA - CO_2
CONDENSERS AND COOLERS
—ANY CAPACITY.
STEAM CONDENSERS

BOILERS
HEAT EXCHANGERS OR
ANYTHING WITH TUBES

Reconditioning and Overhauling Centrifugal and Reciprocating Pumps
Centrifugal and Reciprocating Refrigerating Compressors
Large Stock Tubes on Hand

THE MAINTENANCE DEPARTMENT
of CONDENSER SERVICE & ENGINEERING CO.
Phones: New York, BEekman 3-9363, Hoboken, HOboken 3-6428
100 River Street Hoboken, N. J.
For New Equipment - Write our general office
95 River St., Hoboken, N. J.

they all want AIR-FLO



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

FRONT VIEW—CLOSED

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

WRITE FOR NEW AIR-FLO CATALOG 43-D

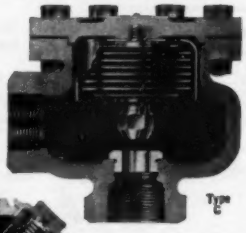
Illustrations and details of the complete Air-Flo line.

AIR CONDITIONING PRODUCTS CO.
2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

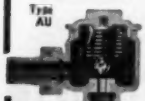
15 of 20 Engineers Prefer Nicholson Traps

To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson. The repeated adoption of Nicholson steam traps by plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog.

5 TYPES FOR EVERY APPLICATION, process, heat, power. Sizes ¼" to 2"; press. to 225 lbs.



Type C



Type AU

Type AHV

BULLETIN 450 or see Sweet's

W. H. NICHOLSON & CO. 198 OREGON STREET WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

pany's line of corrosion resistant linings, including sheet linings, solution or dispersion linings, brick sheathings, and miscellaneous linings.

Draft Control Systems

HPAC 111—The draft control systems of Perfex Corp., Milwaukee 7, are designed to control draft in the firebox during "off" periods, to open the damper before restarting the burner, and to maintain constant draft in the firebox during burner operation. Three new bulletins provide detailed information and cover the various components used. Draft control systems for gas burners, oil burners, and stokers are covered respectively in Bulletins No. 5, 6, and 7.

Dry Type Air Filter

HPAC 112—The metal wool division of Carey Electronic Engineering Co., Springfield, Ohio, has prepared a four page folder on its "A-Lum-O-Aire" dry type air filter. Design and construction features, together with performance data, are given for these units which consist of an aluminum wool filter medium held in an "Aluminized" steel frame.

Electric Radiant Heaters

HPAC 113—Numerous industrial applications of its "Chromalox" electric radiant heater are briefly described and illustrated in a new folder prepared by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8. These heaters are recommended for use in processes which include baking, drying, preheating, dehydrating, etc. Units are also recommended for localized comfort heating.

Evaporative Condensers, Cooling Towers

HPAC 114—The new model P evaporative condensers for "Freon" and ammonia and the model PT cooling towers (both in sizes from 3 to 100 tons) are briefly described and illustrated in a new folder prepared by Baltimore Aircoil Co., Inc., 2519-23 Pennsylvania Ave., Baltimore 17. Features of these units briefly covered include compact design for outdoor installation, the use of slow speed fans, motors which are 95 percent enclosed and have special tropical insulation for outdoor use.

Feedwater Control

HPAC 115—The latest developments in its three-element feedwater control are described in a new 16 page bulletin (No. 105-C) of Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10. The bulletin contains a concise discussion of problems encountered in feedwater control and explains how the air operated, three-element system helps solve them. Diagrams, cutaway views, typical chart records, and photographs of modern installations are included.

Financial, Operating Statements

HPAC 116—Bulletin TM 758 of Remington Rand, Inc., 315 Fourth Ave., New York 10, tells how the company's punched card accounting machines used for other applications can automatically create the general ledger and produce financial and operating statements in a hurry.

Flexible Ball Joint for Piping

HPAC 117—The ball joint of Barco Mfg. Co., 1801 Winnemac Ave., Chicago 40, consists of a short pipe

Grant Wilson

DUX-SULATION

ASBESTOS PROTECTED

INSULATES DUCTS

ABSORBS SOUND

SAVES FUEL

STOPS CONDENSATION

REDUCES POWER COSTS

WRITE...

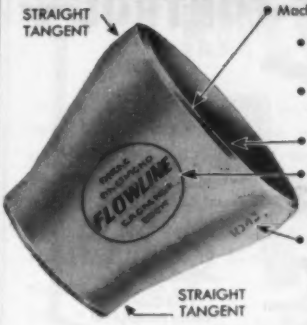
Grant Wilson Inc.

ASBESTOS and INSULATING MATERIALS

141 W. JACKSON BLVD. - DEPT. D - CHICAGO 4, ILL.

A Superior Welding Reducer

with straight tangent on both ends



- Machine tool cut and beveled.
- Formed cold by exclusive Welding Fittings process.
- Annealed, cleaned bright and passivated.
- Smooth interior walls.
- Trade mark, type of material, size, schedule, wall thickness marked.
- Heat number permanently stamped as record of actual analysis and physical properties.

FLOWLINE stainless welding reducers, ells, tees, stub ends, and caps are available in sizes from ½" through 12". 2846 stock items—see Bulletin S-310.

FLOWLINE

STAINLESS WELDING FITTINGS

STAINLESS STEEL TYPES 304, 316, 347

MONEL

INCONEL

NICKEL

WRITE FOR BULLETIN S-310

WELDING FITTINGS CORPORATION, NEW CASTLE, PENNSYLVANIA

World's Largest Manufacturer of Stainless Welding Fittings

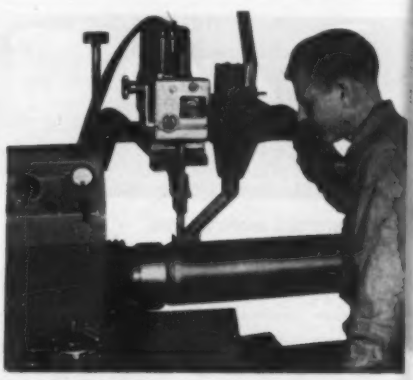
Automatic Submerged Arc Welders

Augment AUTO-RAD Facilities

Automatic submerged arc welders are used by AUTORAD to weld dished elliptical heads to cylinders in the manufacture of pressure vessels. Over thirty years of experience and know-how plus the latest of modern equipment is the reason for AUTORAD leadership in the production of heat transfer equipment. AUTORAD products such as finned pipe, pressure vessels, dished elliptical heads, evaporators and finned radiation, have been giving splendid performance in every state in the Nation for many years.

In addition to submerged arc welders, AUTORAD facilities include heliarc and arc welders to 600 amp. and projection, seam, spot and resistance welders to 200 Kva.

Production facilities are available for the prompt and experienced handling of Government orders.



Shown above is a submerged arc welder and fixture for periphery welding of cylinders and rounds. Capacity to 20" O.D. cylinders, length to 72". Arc is submerged in a mound of flux, with no glare to operator. Cylinder is rotated by fixture at predetermined speeds. Clean, spatterfree welding is thus performed economically.

AUTO-RAD Inc.

Manufacturers of Heat Transfer Equipment Since 1920

3535 Fillmore St., Chicago 24, Illinois

GENERAL CONTROLS

801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 5, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
DISTRIBUTORS IN PRINCIPAL CITIES

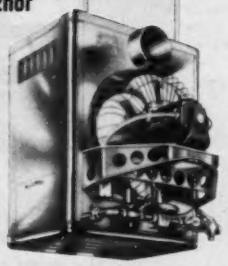
REZNOR

world's largest selling gas unit heater

Hung from ceiling or mounted on floor

Dealers sell more Reznor units than any other

Reznor heaters are not simplified "hot boxes" that burn fuel and let the heat move at random. Reznor gas unit heaters are "machines." They force warm air where your customer wants it most. Being "heating machines," they give machine performance, sell for machine prices and you make more money. Best of all, Reznor heaters are not only the world's best sellers, but they also do the world's best job.
In the U-50 Catalog, you'll see what makes Reznor heaters such fine machines. Send for your copy today.



REZNOR MANUFACTURING CO.
31 UNION ST. · MERCER, PENNA.
Send me 20-page catalog in full color

Name _____

Firm _____

Address _____

City _____ Zone ___ State _____

nipple terminating in an enlarged hemispherical section or ball which is housed inside an outer casing between two molded gaskets. This construction is said to permit rotation as well as side flexing of the ball part in any direction up to 40 deg. Joints are recommended to overcome piping misalignment, to allow for settling or movement of piping, to guard against vibration or shock, etc. Catalog No. 215 covers 12 styles of the joint in 15 different sizes, from ¼ to 12 in. Units are available for seven different service specifications and in six different metals for handling temperatures from –50 to 1000 F, pressures from vacuum to 750 psi steam or 6000 psi liquids.

Hermetic Centrifugal Refrigeration Unit

HPAC 118—Covering the new "Centravac" hermetic centrifugal refrigeration unit, Bulletin DS-399 of The Trane Co., La Crosse, Wis., gives detailed information on design and construction features, applications, capacities, flow arrangements, etc. Diagrams and charts are used to cover the cycle of operation, the lubrication system, purging the system, and sizing equipment.

High Water Level Safety Switch

HPAC 119—The new "Autocon Hi-Level" safety switch of Automatic Control Co., St. Paul 4, Minn., is described and illustrated in Bulletin 7500. Recommended for use in water tanks, rivers, sumps, etc., the unit requires only a ½ in. rise in water level to compress air in a bell chamber which operates a switch to set off either an audible or visual alarm.

Metal Hardness Tester

HPAC 120—Bulletin ET 80, featuring the Ernst portable, direct reading metal hardness tester, has been issued by Newage International, Inc., 521 Fifth Ave., New York 17. Descriptive information relates to the design of the instrument which is pressed at the handgrips on the sides to obtain direct readings for all types of metals. Pertinent illustrations are included and principles of operation, advantages, and applications are covered.

Motor Drives for Large Air Compressors

HPAC 121—Bulletin No. 200-SYN-32 of Electric Machinery Mfg. Co., Minneapolis 13, covers motor drives for all types of large air compressors. Application information and selection data on both motors and controls for a variety of compressor types and sizes are given. Also contained is a discussion of the various methods of motor and control protection for compressor installations.

Motors and Generators

HPAC 122—A 19-page booklet (B-4595) describing the new "Life-Line" type SK d-c motors and generators is available from Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30. It shows how the new design uses rolled steel frames, heavy steel brackets, steel angle feet, and prelubricated double-sealed ball bearings. Information is given on types, enclosures, and mountings for many different types of applications.

Power Table for Sheet Metal Work

HPAC 123—A new multi-drive power table for beading, crimping, burring, turning, wiring, flanging, elbow edging, furnace collar edging and various other sheet metal operations has been introduced by Niagara Machine

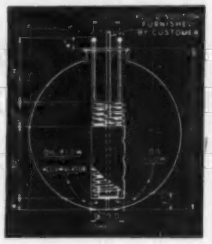
HERE'S THE SOLUTION TO BULK TANK OIL PREHEATING!

REMPE
"Hot Spot"
Storage Tank Preheater

All-steel shell and coil assembly for preheating No. 5 and Bunker "C" oils to proper flow temperature in bulk storage. Suction pipes, inlet and outlet pipes for heating go through manhole cover.

POSITIVE PREHEATING

Heats with either steam or hot water. Oil or other liquids enter preheater from the bottom and pass over coils into flow accumulator before entering suction line. Connections furnished for any diameter tank. Made with 14" and 16" diameter shell.



Write — wire for full details.

REMPE COMPANY

342 N. Sacramento Blvd., Chicago 12, Ill.

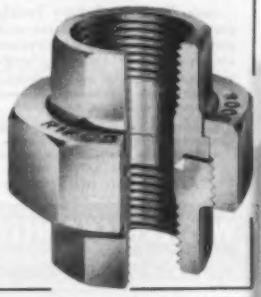
"Manufacturers and Designers of Heat Transfer Equipment"

for HIGH pressures or temperatures
it's the RIFCO 300

The Rifco 300 union is a rugged quality product especially suitable where high pressures or temperatures are encountered. Heavily constructed throughout, with thick pipe ends and nut it will absolutely meet 300 lbs. pressure for steam or 400 lbs. for oil, water or gas.

The bronze seat is an integral part of the unit, but the 300 is also available in All Iron Seat.

The Rifco 300 will put an end to fitting worries. Please write us today for more information.



RHODE ISLAND FITTINGS CO.

355 DEXTER ST.

PROVIDENCE 7, R. I.

INSTANT HEAT!

FOR COLD MORNINGS, HARD-TO-HEAT PLACES

CHROMALOX Electric UNIT HEATERS

EASY TO INSTALL WHEREVER TEMPORARY OR PERMANENT COMFORT HEAT IS NEEDED

CHROMALOX Unit Heaters quickly and economically give needed warmth wherever heat is required. Air is forced across CHROMALOX Finstrip elements by a quiet fan and directed into the desired areas by adjustable louvers. High velocity discharge assures adequate supply of heated air. Units are available with manual or automatic controls in 1.5 to 15 KW. capacities.

WRITE FOR COMPLETE CATALOG

It shows complete line of Chromalox Unit heaters available for permanent or temporary installation. Send for your copy today.

EDWIN L. WIEGAND CO., 7610 THOMAS BOULEVARD, PITTSBURGH 8, PA.

CHROMALOX 19-97

ELECTRIC HEAT FOR MODERN INDUSTRY

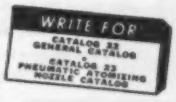
IF YOU USE SPRAY NOZZLES HAVE THESE FACTS BEFORE YOU!

the internal design and capacity of the spray nozzles used in a spraying operation often determine the cost and quality of that operation. See for yourself why Spraying Systems spray nozzles are the SPECIFIED nozzles of industry today. Write for Catalog 22 — the facts are all there.

SPRAYING SYSTEMS CO.

3219 RANDOLPH STREET

BELLWOOD, ILLINOIS



SPRAYING SYSTEMS SPRAY NOZZLES

the SPECIFIED nozzles for industrial use

...keeps **Western Rotary Turbine Ventilators** in operation, providing constant 'round-the-clock exhaust. Western's lifetime-guaranteed bearings are both mounted on the same axis...always stay in alignment...stand up to shipping jolts. Throat sizes from 6" through 48". The typical, clean, attractive silhouette that progressive industry demands. Western turbo-ventilation...high in efficiency, low in cost.

Request our catalogue for information, sizes, capacities, price lists. In 1951 Sweets and A.E.C. Jobbers are invited to participate in our national sales system.

"Always on the job—never on the payroll"

WESTERN ENGINEERING & MFG. CO.
1726-28 E. WASHINGTON BLVD. LOS ANGELES 21, CALIF.

NEW TYPE CI

ADJUSTABLE THERMOSTAT

The new Type CI Adjustable Indicating Thermostat is a precise temperature control for gas, liquid, and metal-to-metal applications, such as ovens, hot plate presses, water baths, incubators, proofing cabinets and cold cabinets. It is most useful on units where periodic checks of temperature are required, advisable, or will prove time-saving. The new Type CI is simply and ruggedly built, employing the highly sensitive response action of a solidly liquid-filled bulb and bellows assembly to a snap-acting switch and indicating pointer. The thermostat is adjustable over its entire range by a knurled thumbscrew on the front of the case.

SPECIFICATIONS:
Case 5½ x 5½ x 1¾"; Wt. 3 lbs. Standard ranges 50°—350°F and 50°—600°F, special ranges may be had between —120°F and +600°F. Standard differentials ½°F in circulating liquid, 2°F in air. Switch ratings 10 amp 125 V AC and 5 amp 250 V AC. Write for new bulletin No. 4816T which gives full details.

UNITED ELECTRIC CONTROLS COMPANY
87 School Street
Watertown, Mass.

STANDARD & SPECIAL THERMOSTATS & PRESSURE SWITCHES

& Tool Works, 637-697 Northland Ave., Buffalo 11. The welded steel table is mounted on casters, has positions for four machines, and incorporates a power unit consisting of a worm reduction unit mounted on anti-friction bearings and operated in a bath of oil. A ¼ hp motor is flange mounted as an integral part of the power unit. Detailed information is given in Bulletin 85-A.

Propeller Fans

HPAC 124—A new general fan catalog (X6849), illustrating in color and describing in detail its complete line of fans, is offered by Emerson Electric Mfg. Co., St. Louis 21. This 32 page catalog gives design and construction specifications with performance data on the various types of desk and stand fans, air circulators, ceiling fans, kitchen ventilators, exhaust, attic, and window fans.

Properties of Alloy Steels

HPAC 125—A six page data sheet (No. NS-3) on nickel-chromium-molybdenum steels has been prepared by International Nickel Co., Inc., 67 Wall St., New York 5. Covering type 8600-8700 series, information is given on chemical composition ranges of standard grades, critical ranges and maximum safe tempering temperatures, suggested annealing treatments, tensile and impact properties of oil quenched and tempered types, low temperature impact properties, and annealed tensile properties.

Radiant Panel Heating Control

HPAC 126—A new slide rule guide to help heating contractors and service men determine the proper thermostatic control for radiant panel heating has been introduced by Minneapolis-Honeywell Regulator Co., 2604 Fourth Ave., S., Minneapolis 8. The pocket calculator, second in a series of handy guides, may be used to calibrate the outdoor and indoor thermostats used with the company's electronic control system for radiant heating.

Radiant Panel Heating with Steel Pipe

HPAC 127—A 48 page illustrated booklet on radiant panel heating with steel pipe is available from the Committee on Steel Pipe Research, American Iron & Steel Institute, 350 Fifth Ave., New York 1. Prepared in collaboration with Raymond Viner Hall, R.A., A.I.A., the booklet outlines the principles underlying radiant heating and describes its development and use throughout the country. Advantages offered by this method are covered and information is given on the basic design of floor, wall, and ceiling panels. Also covered are snow melting and ice removal systems. The question and answer section of the booklet deals with many of the common questions relating to fuel costs, cracking of concrete or plaster, the effects of floor panels on rugs, permissible floor temperatures, etc.

Radiator Valves and End Line Evacuators

HPAC 128—The "Steamheat Master" radiator valves and end line evacuators of Radiator Valve Co. of America, 428 S. 52nd St., Philadelphia 43. are designed to utilize an induced vacuum principle to remove air and to draw heat to steam radiators before any measurable pressure is built up in the system. This, says the company, is done by the pumpless action of an instantaneous seal. The

USE MERCOID CONTROLS
FOR OIL BURNERS, STOKERS, GAS BURNERS, REFRIGERATION, AIR CONDITIONING AND VARIOUS INDUSTRIAL APPLICATIONS

IT'S THE MERCURY SWITCH THAT DISTINGUISHES Mercoid FROM THE AVERAGE LINE OF CONTROLS

INSURING GREATER SAFETY, BETTER PERFORMANCE AND LONGER CONTROL LIFE

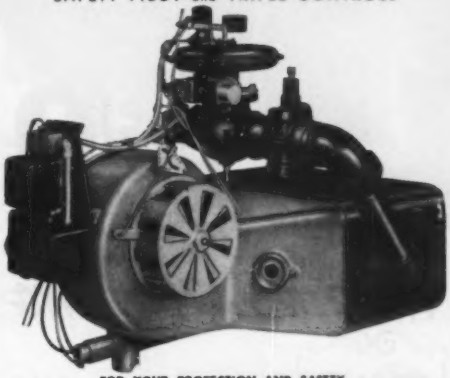
CATALOG SENT UPON REQUEST

IT PAYS TO GET THE BEST

THE MERCOID CORPORATION, 4201 BELMONT AVE., CHICAGO 41, ILL.

The Mettler "FAN-AIR" Gas Burner

LATEST MODEL FEATURES NEW AUTOMATIC SAFETY PILOT and TRIPLE CONTROLS



FOR YOUR PROTECTION AND SAFETY

Picture reveals some of the essential and desirable POINTS of FAN-AIR MECHANICAL DRAFT GAS BURNERS. Not just a burner but a COMPLETE and FULLY AUTOMATIC GAS BURNER SYSTEM, factory tested and ready for application when received. Furnished complete as pictured with simple, dependable automatic "On and Off" or modulating controls. Burner and Controls WITH SPARK IGNITION and FLAME SAFEGUARDS are scientifically coordinated to provide INSTANT FUEL SHUT-OFF on FLAME FAILURE—MEETING APPROVAL REQUIREMENTS. Why be satisfied with less—when all these tangible advantages are so readily available. Sizes 5 to 500 H.P.

Write for BULLETIN—

THE METTLER CO., INC.

(Note New Address)

4366 Worth Street, Zone 63, Los Angeles, Calif.

FOR SPEED AND ECONOMY INSULATE WITH

Miracle

SURFACE ANCHORS AND ADHESIVES

Miracle Surface Anchors bonded with Miracle Adhesives provide firm anchorage for all types of insulation. This includes Batt, Fiber Glass, Foam Glass, Cork, etc. to ducts, walls, or ceilings. No drilling, welding, bolts, screws or other mechanical means of attachment required. Miracle Surface Anchors are available in a variety of shapes and sizes to accommodate the particular job, and have been endorsed by leading Insulation Contractors and Architects everywhere because of their labor and time saving features. For information write: Dept. HPAC-351

MIRACLE ADHESIVES CORP.
214 E. 53rd St., New York 22

For anchors write
DEVICES, INC.
214 E. 53rd St., New York 22

45

In order to give You MAXIMUM SERVICE Register and Grille Mfg. Co., Inc. have 45 Representatives Conveniently Located in all Principal Cities

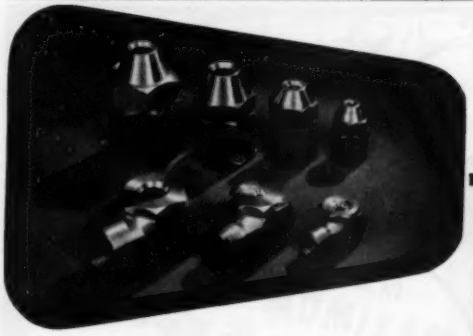
14 different styles for Air Conditioning have recently been Standardized...Write for Catalog with over 150 Illustrations.

REGISTER & GRILLE MFG. CO., INC.
70 BERRY STREET, BROOKLYN 11, N. Y.

G&O RADIATION

A full line of sizes now available to meet all industrial requirements. Send for catalog.

THE G&O MANUFACTURING COMPANY
New Haven 8, Connecticut
Pioneer Manufacturers of Square Finned Tubing in the United States



SPRAY NOZZLES and ACCESSORIES

Delavan now offers a complete line of spray nozzles and accessories to meet every spraying requirement. The name Delavan is your assurance of top quality and outstanding performance.

WRITE FOR CATALOG NO. 30

DELAVAN MANUFACTURING CO.
3009 SIXTH AVENUE
DES MOINES 13, IOWA

valves are said to offer no resistance to the outward flow of air, but to seal instantly against the return of air to the system, each valve having a positive action temperature control which closes when radiators are sufficiently heated. The various units are described and illustrated in a new folder.

Refrigeration Compressor Lubrication

HPAC 129—The Vol. 37, No. 1 issue of the house organ published by The Texas Co., 135 E. 42nd St., New York 17, features an article on the lubrication of industrial refrigeration compressors After discussing the various types of compressors and lubrication systems, the article covers lubricating oil performance, compression ratio, pressure and temperature, and refrigeration oil characteristics.

Refrigeration Oils

HPAC 130—Characteristics and recommended applications for various grades of its refrigeration oils are detailed in a new 12 page booklet prepared by Sun Oil Co., Philadelphia 3. Information is given on how "Suniso" oils help to increase system efficiency and reduce maintenance. A description of the floc test for determining the suitability of an oil to low temperature conditions is included.

Remote Measurement and Automatic Control

HPAC 131—A new folder (Bulletin DMO29) on telemetering has been published by Bristol Co., Waterbury, Conn. It contains information on the use of the company's "Metameter" for remote measurement and automatic control of variables over distances ranging from a few feet to many miles. A large number of typical installations are described and illustrated, and among the applications shown are the remote control of temperatures, pressures, rates of flow, level of liquids, motion, and various electrical quantities.

Snap-Acting Contact Units

HPAC 132—Bulletin M-2-D of Penn Electric Switch Co., Goshen, Ind., covers its line of snap-acting contact units and lists various types suitable for application where a mechanically-operated electric switch is required. The bulletin gives complete ordering specifications for both open and closed types, single and double pole types, and light and heavy duty types. Specifications include operating characteristics, electrical data, and roughing-in dimensions.

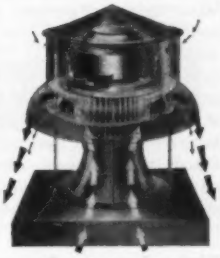
Traps, Reducing Valves and Regulators

HPAC 133—The new 33 page catalog of C. E. Squires Co., 18502 Syracuse Ave., Cleveland 10, contains descriptive material on steam and air traps, pressure reducing valves, pump governors, pressure regulators, boiler feed controls, and temperature regulators. Data for sizing equipment include trap capacity tables, reducing valve selection charts, reducing valve capacities, etc.

V Belt Drives

HPAC 134—A new 106 page bulletin has been prepared by the mechanical goods division of United States Rubber Co., Rockefeller Center, New York 20, on its "U.S. Rainbow" multiple and light duty v belt drives. Featuring

GALLAHER CERTIFIED RATINGS FACT NOT THEORY



Pats. 2526290, 2188741

Be sure of performance in your ventilation system. Gallaher ratings are the result of independent laboratory tests by a nationally recognized authority. They are not theoretical calculations but actual tests every step of the way for all conditions of performance. Capacities 150-12,000 CFM; Static pressure to 1¾".

This feature plus built-in scroll effect, motor out of the air stream, squirrel-cage fan, low silhouette, rugged weatherproof construction, economy of installation and maintenance and a patented hood ventilation system that forms a positive air seal-off against fumes, makes the Gallaher Air-Van outstanding.

For full information see your local Gallaher representative or write Department H, 4108 Dodge St. Omaha 2, Nebraska

The GALLAHER Company
Omaha, Nebr. Owatonna, Minn.

32 EASTERN SEABOARD BRANCHES

BRINGING 33,000 PRODUCTS OF OVER 1900 MANUFACTURERS IN *ONE* DELIVERY

HAJOCA CORPORATION

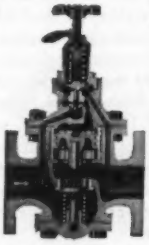
Manufacturers and Distributors of Plumbing, Heating, Industrial and Refrigeration Supplies and Equipment

See Your Telephone Directory for Branch Locations

GENERAL OFFICES, 31st & WALNUT STS., PHILADELPHIA 4, PA.

LESLIE Reducing Valves for PLANT STANDARDIZATION

Standardization of regulating equipment for industrial plants has been a subject strongly emphasized by LESLIE for many years to reduce maintenance costs, and store's requirements for repair parts, to increase flexibility in operation and conversion.



Class L-3
LESLIE Pressure Reducing Valve

LESLIE offers these plant standardization values:

- ★ DEPENDABLE APPROVED PERFORMANCE
- ★ LOWEST OVERALL COST PER OPERATING YEAR
- ★ WIDE RANGE OF ADJUSTMENT
- ★ INTERCHANGEABILITY OF INTERNAL PARTS
- ★ RENEWABLE PARTS
- ★ RECOGNIZED QUALITY AND WORKMANSHIP
- ★ A COMPLETE LINE OF REGULATORS

SEND FOR your copy of Bulletin—"Reducing Valves, How to Select and Install".

LESLIE CO.
237 Grant Ave. Lyndhurst, New Jersey

ESTABLISHED 1900 LESLIE CO.

PRESSURE REDUCING VALVES • • PRESSURE CONTROLLERS
PUMP GOVERNORS • • • TEMPERATURE REGULATORS
SELF CLEANING STRAINERS • • LESLIE-TYFON WHISTLES

know the condition of your air filters

HAYS AIR FILTER GAGE

easy to read—large dial, visible at a distance.

easy to check at zero—no oil to evaporate and no leveling is required.

constant accuracy—with Hays "slack diaphragm", measuring unit retains accuracy. Outside zero adjusting screw provided.

send for Bulletin 48-751

Get complete details on this accurate indicator of filter efficiency. The Hays Air-Filter Gage measures the actual resistance air meets passing through the filter. You KNOW when it's time to replace. Can be furnished with flash or sound alarms or with damper controls.

THE HAYS CORPORATION

MICHIGAN CITY 14, INDIANA

combustion and industrial instruments and control

For the BEST in
INSULATED PIPING
Specify RIC • WIL
If your design problem involves insulated piping, your most efficient answer is Ric-wil Prefabricated Insulated Piping.
Architects, engineers, and contractors have long recognized Ric-wil engineering and high-efficiency operating performance—factors that make Ric-wil "the Greatest Name in Insulated Piping".
Ric-wil
PREFABRICATED
INSULATED PIPING
UNDERGROUND OR OVERHEAD
THE RIC-WIL COMPANY - CLEVELAND, O.

Seal Pipe Joints
with
KEY-TITE
WATER PROOF
PIPE JOINT
COMPOUND
Stops
Needless
Waste
Pipe joints sealed with Key-Tite cannot leak. Key-Tite is a perfect seal on all lines carrying water, gas, low-pressure steam, compressed air, etc. It contains no lead or substitutes and does not affect the taste or odor of potable liquids. Joints are easily opened, too, for it will not freeze in the joint. Stop losing money through leaky pipe joints...seal with Key-Tite.
Send for Free Sample
Try Key-Tite in Your Own Plant at Our Expense
KEY Company
KEY COMPANY
2617 S. 27th St., East St. Louis, Ill.

design and selection data, the catalog also covers sheaves and open end v belting. Typical applications are illustrated and comparison charts show interchangeability with other makes. Information is given on how to select a drive from the tables included in the manual and data are given for the design of special drives.

Water Level Gages

HPAC 135—Describing instruments for measuring and recording water depth in reservoirs, elevated tanks, rivers, lakes, irrigation systems, process storage tanks, forebay and tail races, flumes, and weirs, Bulletin L700 has been released by Bristol Co., Waterbury, Conn. Float, pressure bulb, pressure, counterpoise, differential pressure, and air bubbler types of liquid level gages for a variety of uses are described. Information is also given on the measurement and automatic control of water and other liquids and solutions, whether flowing, turbulent, corrosive, under static pressure, covered with ice, or carrying solid matter. Applications of the instruments to chemical processing operations are included.

Water Pressure Reducing Valve

HPAC 136—Golden-Anderson Valve Specialty Co., 2104 Keenan Bldg., Pittsburgh 22, has released Bulletin No. W-3 on its cushioned water pressure reducing valve. Installation, operation, adjustment, servicing and specifications are described, and tables show general dimensions, approximate shipping weights and lists of materials.

Favors Central Systems for Conditioning Old Buildings

"For general economy, we must rely on central systems as a practical necessity, at least in part, for conditioning large existing buildings." This is the opinion of Walter L. Fleisher, consulting engineer, as expressed in an article on air conditioning old buildings, which was presented at the recent annual meeting of the American Society of Refrigerating Engineers, 40 W. 40th St., New York City.

In discussing modern methods of air conditioning large buildings, the author states that in the newest buildings, principally office structures and some hotels, there has been an attempt to combine heating and cooling in the same units, particularly around the periphery of the building. This method, he says, is based on the assumption that a large part of the cooling and heating requirements is due to transmission of heat or cold through the outer walls and windows. In his opinion this method is only sufficient to take care of about 15 or 18 ft of depth, and as many buildings being conditioned are on plots at least 100 × 200 ft, it is obvious that large portions of the buildings which must be utilized require supplementary conditioning which can be obtained only by the old method of central distributing systems.

After pointing out some of the problems which often prove to be particularly troublesome in connection with old buildings (such as space for risers, returns, drips, ducts, and cooling towers), Mr. Fleisher discusses the various types of systems now being used. He strongly favors separation of the heating and cooling systems of existing buildings and states that the simplest method of accomplishing this is by means of a central system of the proper size to fit the building construction.

"BEND-EZY" FORCED AIR REGISTERS and GRILLES

Illustrates how easy it is to set the bars with a "Bend-Ezy" tool.

Write for NEW Catalogue—
Contains complete information—fully illustrated

• FLOOR REGISTERS, One-piece frame construction
• GRAVITY BASEBOARD REGISTERS • COLD AIR FACES • PERFORATED METALS FOR EVERY INDIVIDUAL USE. *PROMPT DELIVERIES*

STANDARD STAMPING & PERFORATING CO.
3151 W. 49th PLACE · CHICAGO, ILLINOIS

EFFICIENT, LOW COST AIR REMOVER

Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER

For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

MUCKLE MANUFACTURING CO. • OWATONNA 8, MINN.

classified advertising . . .

Is the quick, economical way to find what you're looking for. Check the classified page each and every issue for real bargains and hard to find items. It's a quick and sensible means too, of disposing of tools, equipment, and anything else for which you no longer have use. Check the classified page for rates.

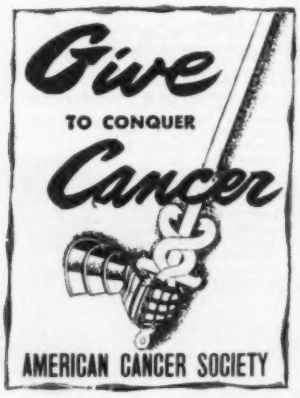
ENGINEERS
for research and development

Openings for graduate engineers to work in fully equipped, modern research laboratory. Must be experienced in the design of heating equipment and have the ability to supervise and carry out development projects, having both military and domestic applications. Write or call for appointment, giving full experience information and salary expected.

FLUID HEAT DIVISION
ANCHOR POST PRODUCTS, INC.
6500 Eastern Avenue Baltimore 24, Maryland

CLASSIFIED ADVERTISING

Classified Section: Rates for classified advertising are 12 cents for each word, including heading and address. One inch $6.00. Count nine words for keyed address. Minimum $2.00 for each insertion. Cash must accompany order.



Manufacturers' Agents

Are you interested in securing additional lines?

We are occasionally asked by our manufacturer advertisers to suggest the names of manufacturers' agents in various sections of the country whom they can contact in regard to representation of their industrial large building heating, piping and air conditioning products.

If you would like your name listed on our records for inquiries we may receive on your territory, we invite you to write us. There is no charge in connection with this service.

HEATING, PIPING & AIR CONDITIONING
6 N. Michigan Ave. Chicago 2, Ill.

situation open

Fan Engineer — experienced in all phases of centrifugal and axial design to take charge as Chief Engineer for medium sized mid-western fan manufacturer. In replying state experience, age, etc. Our employees know of this ad. Address Key #891-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

miscellaneous

Time saving table for finding pipe size required for steam distribution mains 50 to 150 lbs. PSI — ½ lb. to 30 lb. pressure drop. Size for any delivery up to 300,000 pounds per hour can be determined in a few seconds by one calculation. Two sizes 8½" x 11" — 17" x 22". For copy send $1.00 to J. E. Hamersley, Engineer, 263 Cochran Road, Lexington, Ky.

situation wanted

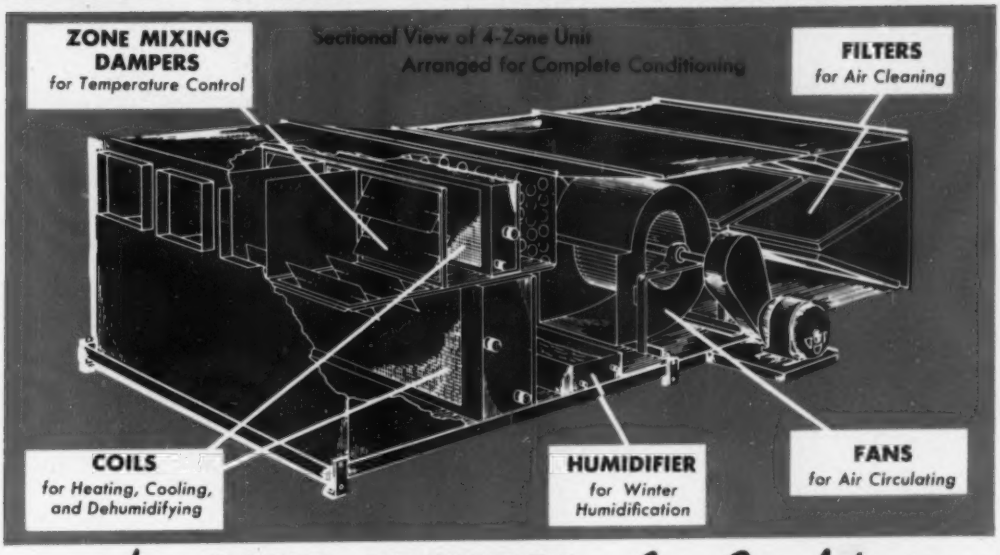
Sales Engineer, age 36, with 12-year successful sales record for manufacturers' agency and manufacturer in heating and ventilating field. Address Key #897-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

INDEX TO ADVERTISERS

A-J Mfg. Co. 241
Acme Industries, Inc. 178
Aeroﬁn Corp. 190
Air Conditioning Products Co. 262
Air Devices, Inc. 219
Air-Maze Corp. *
Airtherm Mfg. Co. 234
Alco Valve Co. 50
Aldrich Co. 261
Allen-Bradley Co. 186
Allis-Chalmers Mfg. Co. 23, 57 & 192
American Air Filter Co. 24 & 25
American Blower Corp. 35
American Brass Corp., The 18
American Chain & Cable Co., The *
American District Steam Co. 47
American Radiator & Standard Sanitary Corp. 229
American Wheelabrator & Equip. Corp. 253
Ames Iron Works 255
Anchor Post Prods., Inc. 271
Anderson Co., V. D. 227
Anemostat Corp. of America 211
Armstrong Cork Co. 41
Armstrong Machine Works 188
Atlas Mfg. Co. 241
Auer Register Co. 222
Aurora Pump Co. 233
Automatic Switch Co. 237
Autorad, Inc. 263
Babcock & Wilcox Co. 64
Bacharach Industrial Instrument Co. 271
Badger Manufacturing Co. 236
Baker Refrigeration Corp. *
Baltimore Aircoil Co. *
Barber-Colman Co. 197
Barnes & Jones, Inc. 235
Bell & Gossett Co. 39 & 60
Binks Mfg. Co. 244
Bishop & Babcock Mfg. Co., The 261
Black & Decker Mfg. Co. *
Breidert Co., G. C. 255
Bristol Company, The *
Brown Products Co. *
Brundage Co. *
Brunner Mfg. Co. 20
Bryant Heater 175
Buffalo Forge Co. 42 & 43
Buffalo Pumps, Inc. 68
Builders-Providence, Inc. *
Bundy Tubing Co. 34
Burnham Corporation 171
Bush Mfg. Co. *
Byers Co., A. M. *
Campbell Heating Co. 161
Carey Mfg. Co., The Philip *
Carnegie-Illinois Steel Corp. *
Carrier Corp. *
Cash Co., A. W. 207
Century Electric Co. 45
Chase Brass & Copper Co. *
Chicago Pump Co. 174
Clarage Fan Co. Inside Back Cover
Cleaver-Brooks Co. *
Cleveland Fuel Engineering Co. 16
C-O Two Fire Equipment Co. 206
Combustion Control Corp. *
Combustion Engineering—Superheater Inc. 194
Committee on Steel Pipe Research of American Iron & Steel Institute *
Condenser Service & Engineering Co. 261
Connor Engrg. Co., W. B. 31 & 173
Continental Air Filters Co. 218
Cork Import Corp. *
Crane Co. 54
Crocker Wheeler Div. Elliott Co. 160
Curtis Refrigerating Machine Co. *
Cyclotherm Corp. *
Davis Engineering Corp. 245
De Bothezat Fans Division American Machine & Metals, Inc. 217
Delavan Mfg. Co. 268
Detroit Lubricator Company *
Detroit Stoker Co. *
Dodge Mfg. Co. 202
Dole Refrigerating Co. 247
Dole Valve Co., The *
Dollinger Corp. 55
Dravo Corporation 168
Dunham Co., C. A. 56
Durant Insulated Pipe Co. *
Duriron Co., Inc., The *
Dwyer Mfg. Co., F. W. 261
Eagan Co., Walter H. 259
Eclipse Pioneer Div. Bendix Aviation Corp. *
Economy Pumps, Inc. *
Elco Tool & Screw Corp. *
Emerson Elec. Mfg. Co. *
Enterprise Engine & Foundry Co. *
Fairbanks Co. 246
Farr Co. 9
Fedders-Quigan Corp. *
Fisher Governor Co. 172
Fitzgibbons Boiler Co., Inc. 153
Foster Wheeler Corp. *
Frick Co. 250
Fulton Sylphon Co. 40
G. & O. Mfg. Co., The 268
Gallaher Co. 269
General Controls Co. 264
General Electric Co. 210
General Gas Light Co. 203
Glastioss Corp., The 205
Globe Steel Tubes Co. *
Governair Corp. 225
Greenlee Tool Co. 233
Grinnell Co., Inc. Inside Front Cover
Gustin Bacon Mfg. Co. 49
H & H Tube & Mfg. Co. *
Hajoca Corporation 269
Hamilton-Thomas Corp. *
Handy & Harman *
Haney Gas Burners & Engineers *
Hapman-Dutton Co. 251
Harrington & King Perforating Co., The *
Hayes Furnace & Mfg. Co., Inc. 185
Hays Corp. 269
Hendrick Mfg. Co. *
Henry Valve Co. *
Hoffman Specialty Co. 180
Holsclaw Bros., Inc. *
Howell Electric Motors Co. *
Hussey & Co., C. G. *
Ilg Electric Ventilating Co. 17
Illinois Engineering Co. 200
Illinois Testing Laboratories, Inc. *
Independent Register Co. 232
Industrial Sound Control Inc. *
Infra Insulation, Inc. 215
Ingersoll-Rand *
Iron Fireman Mfg. Co. 199
Jefferson Union Co., Inc. 260
Jenkins Bros. 212
Jenn Air Products Co. *
Johns-Manville 251
Johnson Co., S. T. *
Johnson Corp. 193
Johnson Service Co. Outside Back Cover
Joy Mfg. Co. 15
Kaiser Aluminum & Chemical Sales, Inc. *
Kaylo Div., Owens-Illinois Glass Co. *
Keasbey & Mattison Co. *
Kennard Corp. 198
Kennedy Valve Mfg. Co., The *
Kewanee Boiler Corp. 53
Key Co. 270
Klipfel Valves, Inc. *
Kramer Trenton Co. *
Kritzer Radiant Coils, Inc. *
Ladish Co. 189
Leslie Co. 269
Lilie-Hoffmann Cooling Towers, Inc. *
Lincoln Electric Co., The *
Little Giant Vaporizer Co., Inc. *
Lufkin Rule Co., The *
Lunkenheimer Co., The *
Lycoming Spencer Div., Avco Mfg. Corp. 208
Marley Co., The 159
Marlo Coil Co. *
Marsh Heating Equipment Co. 196
McCord Corp. 247
McDonnell & Miller, Inc. 157
Mechanical Industries Production Co. *
Mercoid Corp., The 267
Mettler Co., Lee B. 267
Mid-Continent Metal Products Co. 252
Midwest Piping & Supply Co. 209
Mineralac Electric Co. *
Minneapolis-Honeywell Regulator Co. 230 & 231
Miracle Adhesives Corp. 267
Modine Mfg. Co. 12
Moore Co. *
Muckle Mfg. Co. 271
Mueller Brass Co. 33
Mueller Furnace Co., L. J. 220
Multi-Vent Div., Pyle National Co. *
Mundet Cork Co. 36
Murray Mfg. Co., D. J. *
Nash Engineering Co. 72
National Heater Co. 249
National Radiator Co., The *
National Tube Co. 26
Nelson, Herman Div. of American Air Filter Co., Inc. *
Nesbitt, J. J. 62 & 63
New York Blower Co., The 169
Niagara Blower Co. 235
Nicholson & Co., W. H. 262
Ohio Brass Co. 6
Ohio Injector Co. 52
Olson & Company, Arthur A. *
Orr & Sembower, Inc. 59
OverHead Heaters, Inc. *
Owens-Corning Fiberglas Corp. 32
Patterson-Kelley Co., Inc., The *
Peerless Elec. Co. 239
Peerless Pump Div., Food Machinery & Chemical Corp. 167
Penn Electric Switch Co. 195
Perfex Corp. 259
Phillips Cooling Tower Co., Inc. *
Pittsburgh-Corning Corp. *
Porter & Co., H. W. 242
Powder Power Tool Corp. *
Powers Regulator Co., The 10 & 11
Pratt-Daniel Corp. *
Pritchard Co., J. F. 7
Propellair, Inc. 248
R P & C Division American Chain & Cable Co., The 27
Ramset Fasteners, Inc. 237
Randall Graphite Bearings, Inc. *
Raytheon Manufacturing Co. *
Register & Grille Mfg. Co. 267
Refrigeration Engineering, Inc. *
Reinhard Brothers Co. *
Rempe Co. 265
Republic Steel Corp. *
Research Products Corp. *
Revere Copper & Brass, Inc. 71
Reynolds Metals Co. *
Reznor Manufacturing Co. 264
Rhode Island Fittings Co. 265
Ric-Wil Co., The 270
Ridge Tool Co. 226
Rockwell Co., W. S. 260
Roth Co., Roy E. *
Russell Elec. Co. *
SKF Industries, Inc. 187
Sarco Co., Inc. 30
Sarcotherm Controls Inc. *
Schaub Engineering Co., Fred H. *
Schnacke, Inc. 191
Sellers Engineering Co. *
Servel, Inc. *
Siemon & Co. *
Skidmore Pumps 243
Smith Co., Inc., H. B., The 4
Spang-Chalfant Div. of The National Supply Co. 14
Spence Engineering Co., Inc. 166
Sporlan Valve Co. *
Spraying Systems Co. 265
Standard Stamping & Perforating Co. 271
Stephens-Adamson Mfg. Co. 184
Sterling, Inc. 256
Sterling Electric Motors *
Stic-Klip Mfg. Co. *
Strong, Carlisle & Hammond Co. *
Sturtevant Co., B. F., Div. of Westinghouse Elec. 48
Superior Combustion Industries, Inc. *
Surface Combustion Corp. *
Swartwout Co. 238
Taco Heaters, Inc. 176 & 177
Taylor Forge & Pipe Works 201
Taylor Instrument Cos. 154 & 155
Terre Haute Boiler Works Co. *
Thrush & Co., H. A. 19
Titus Mfg. Corp. 13
Titusville Iron Works Co., The Div. of Struthers Wells Corp. 240
Trane Co., The 28 & 29
Tri-Clover Machine Co. *
Tube Turns, Inc. 223 & 224
Tuttle & Bailey, Inc. 58
Typhoon Air Conditioning Co., Inc. *
Union Asbestos & Rubber Co. 181
Unistrut Products Corp. 61
United Cooling Tower Co. 257
United Electric Controls Co. 266
United States Air Conditioning Co. 1
United States Steel Co. 165
Vulcan Radiator Co. 183
Wagner Electric Corp. 38
Waldron Co., John 254
Wallace Co., William 164
Walworth Co. 22
Ward Leonard Elec. Co. 228
Watson-Stillman Co. 163
Webster & Co., Warren 67
Webster Engineering Co., The 245
Weil Pump Co. *
Weinman Pump Mfg. Co. 258
Welding Fittings Corp. 263
Western Engineering & Mfg. Co. 266
Westinghouse Elec. Corp. *
Wheatland Tube Co. 182
Wheeler Mfg. Co., C. H. 156
White-Rodgers Electric Co. 37
Whitlock Mfg. Co. 249
Wiegand Co., Edwin L. 265
Will-Burt Company, The 204
Wilson & Co. 257
Wilson, Inc., Grant 263
Wing Mfg. Co., L. J. 46
Wolverine Tube Div. of Calumet & Hecla Consolidated Copper Corp. 8
Worthington Pump & Machinery Corp. 44
Yarnall-Waring Co. 239
York Corp. 158
York-Shipley 162
Young Radiator Co. 51
Youngstown Sheet & Tube Co. 21
Zallea Bros. 179
Zink Co., John 243

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

Blow-Thru MULTITHERMS



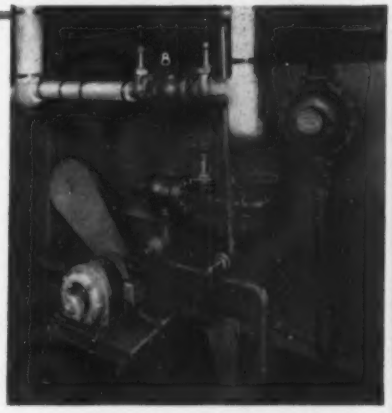
for ZONE CONTROL *Air Conditioning*

Different Temperatures and Humidities at the SAME Time with ONE Unit

One Clarage Blow-Thru Multitherm can be used to air condition various parts of your building exactly as your requirements warrant.

ZONE CONTROL compensates for the difference in solar radiation on different parts of a building during different times of the day. It also takes into account variations of exposure, wind velocity, construction, and different internal heat loads.

Thus winter and summer, if desired, you can maintain *different temperatures and different humidities* in various parts of your building. Each zone is automatically and independently controlled — yet only ONE Clarage Blow-Thru Multitherm required.



This 3-zone Blow-Thru Multitherm unit air conditions the 2-story office building of the Northern Indiana Brass Co., Elkhart, Indiana. Installation made in December, 1940.

CLARAGE
—HEADQUARTERS for Air Handling and Conditioning Equipment

NEW BULLETIN 1310 gives descriptive details, specifications, capacities, and dimensions. Send for your free copy today.

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

MODERN CONTROL IN FAMOUS BUILDINGS: NEW AND OLD

• **Texas Company Office Building, Houston, Texas:** This 30-year-old building recently was air conditioned, sectionally, with four "control zones" on each of its 13 floors, regulated by a comprehensive system of Johnson Thermostats and Dampers

• **General Petroleum Corporation, Los Angeles, Calif.:** A thousand Johnson Control stations mix the warm and cool air in this largest office building in Los Angeles. Each 14-foot area has its own "weather", some being heated at the same time that others are being cooled.

• **Confederate Memorial Hospital, Shreveport, La.:** Hundreds of heat convectors are controlled by Johnson *Individual* Room Thermostats, together with flexible arrangements of other Johnson Control apparatus to solve the temperature problems which are presented by the special requirements of hospital techniques.

• **John Hancock Mutual Life Insurance Company, Boston, Mass.:** Johnson Control for 1250 air conditioning units involves nearly 800 Johnson Room Thermostats with an associated Johnson Valve and Damper Operator in each unit. Johnson Outdoor Master Control regulates the 16 systems which supply primary air to the units.

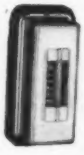
AUTOMATIC TEMPERATURE CONTROL

"Planned for the Purpose" by JOHNSON

Automatic temperature control systems, in the larger buildings, must be "Planned-for-the-Purpose" if they are to meet the varied requirements of each individual heating, cooling, ventilating or air conditioning installation. This distinctive Johnson policy has been followed ever since the first Johnson apparatus was manufactured, 65 years ago.

The complete responsibility of Johnson service—design, manufacture, and installation centered in one organization—makes advance planning possible. There is no danger of too many cooks spoiling the broth.

Johnson engineers, in direct branch offices throughout the country, see every job through from start to finish. That is the proved way to insure that temperature control systems function correctly, automatically answering the needs of each building, in the interests of economy, comfort and convenience.



Any problem in automatic temperature control can be solved best by Johnson, against a background of years of experience and development. Often, existing systems can be modernized with little expense—resulting in worthwhile savings. Call a nearby Johnson engineer for a conference which entails no obligation whatsoever. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

Johnson

Automatic Temperature and Air Conditioning

Control

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885